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AN EMPIRICAL, GRAPHICAL, AND ANALYTICAL STUDY OF THE RELATIONSHIP BETWEEN VEGETATION INDICES

Lyle F. Lautenschlager and Charles R. Perry, Jr.
U.S. Department of Agriculture
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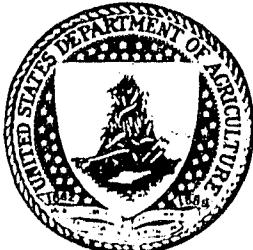
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The aim of science is to seek the simplest explanation of complex facts. We are apt to fall into the error of thinking that the facts are simple because simplicity is the goal of our quest. The guiding motto in the life of every natural philosopher should be, "Seek simplicity and distrust it".

Alfred North Whitehead

ABSTRACT

Since the launching of Landsat I in 1972, investigators have derived numerous formulae for the reduction of multispectral scanner (MSS) measurements to a single value (vegetation index) for predicting and assessing vegetative characteristics such as plant leaf area, total biomass and general plant stress and vigor. This report summarizes the origin, motivation, and derivation of some four dozen vegetation indices. Empirical, graphical, and analytical techniques are used to investigate the relationships among the various indices. It is concluded that many vegetative indices are very similar, some being simple algebraic transforms of others.

1. INTRODUCTION

Current and accurate information on a global basis regarding the extent and condition of the world's major food and fiber crops is important in today's complex world. Traditional sampling techniques for estimating crop conditions, based on field collection of data, are time consuming, costly, and not generally applicable to foreign regions. An alternate approach is remote sensing - the science and art of obtaining information about an object, area, or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area, or phenomenon under investigation [Lillesand and Kiefer (1979)].

A series of earth resources technology satellites (Landsats) have provided a way to monitor worldwide crop conditions since 1972. The sensor system onboard the Landsats, the multispectral scanner (MSS), measures the reflectance of the scene in four wavelength intervals (bands or channels) in the visible and near-infrared portions of the spectrum. The spectral measurements are influenced by the vegetation canopy, soil type, and atmospheric condition.

Investigators have developed techniques for qualitatively and quantitatively assessing the vegetative canopy from spectral measurements. The objective has been to reduce the four bands of Landsat spectral data to a single number for predicting or assessing such canopy characteristics as leaf area, biomass, percent ground cover, and plant population.

This report summarizes and references the origin, derivation, and motivation for some four dozen of these formulae which are referred to as vegetation indices (VIs). The VIs are categorized on the basis of statistical correlations and algebraic similarities. This analysis reveals the similarities of many vegetation indices.

2. LANDSAT DATA CHARACTERISTICS

Three Landsats have been launched since the summer of 1972, with Landsats 2 and 3 still operational. Each satellite is capable of providing 18-day repetitive coverage of the earth's surface. Each Landsat's onboard four-channel MSS system measures reflectance in four bands (fig. 1). The measurements are converted to digital counts and transmitted to receiving stations. Landsat MSS images cover an area of 185 by 185 kilometers and are composed of 7,581,600 picture elements (pixels). [Watkins and Freedon (1979)].

Typical reflectance patterns for herbaceous vegetation and soil are compared in figure 1. Dead or dormant vegetation has higher reflectance than living vegetation in the visible spectrum and lower reflectance in the near-infrared. Soil has higher reflectance than green vegetation and lower reflectance than dead vegetation in the visible, whereas in the near-infrared, soil has lower reflectance than green and dead vegetation [Tappan (1980)]. Jackson et al. (1980), Tucker and Miller (1977), and Deering et al. (1975) provide an extensive discussion of reflectance properties. Three papers of historical interest are Jordan (1969), Knipling (1970), and Pearson and Miller (1972).

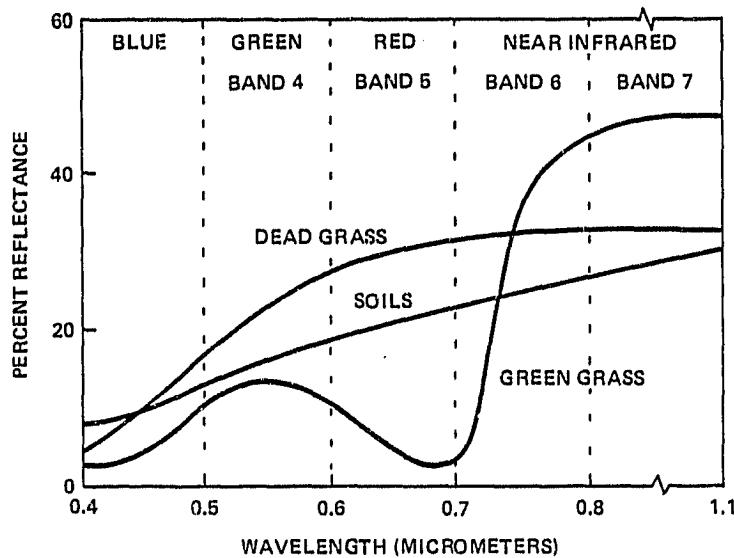


Figure 1. Typical Reflectance of herbaceous vegetation and soil from 0.4 to 1.1 micrometers.

3. DEVELOPMENT OF VEGETATION INDEX FORMULAE

Numerous vegetation indices have been used to make quantitative estimates of leaf area index, percent ground cover, plant height, biomass, plant population, and other parameters [Pearson and Miller (1972) and Wiegand et al. (1974)]. The formulae are based on ratios and linear combinations of the MSS bands.

The individual Landsat bands (CH4, CH5, CH6, CH7) have been used to estimate percent ground cover and vegetative biomass [Wiegand et al. (1974) and Seevers et al. (1973)]. The correlation coefficients reported ranged from 0.295 for CH7 with crop cover to 0.877 for CH6 with leaf area index. Similar correlations were reported by Tucker (1979).

Ratios of the Landsat bands have been used to estimate and monitor green biomass, etc. [Rouse et al. (1973, 1974), Carnegie et al. (1974), Johnson (1976), and Maxwell (1976)]. The obtained coefficients of determinations were slightly higher than those for the corresponding band differences. The twelve pairwise ratios (six of which are inverses of the other six) will be denoted by $R_{45} = CH_4/CH_5$, $R_{46} = CH_4/CH_6$, etc.

Rouse et al. (1973, 1974) proposed using the normalized difference of Landsat channels 7 and 5 for monitoring vegetation, which will be referred to as ND7. Deering et al. (1975) added 0.5 to ND7 to avoid negative values and took the square root of the result in hopes of stabilizing the variance. This index is referred to as the transformed vegetation index and will be denoted by TVI7. Similar formulae using channels 6 and 5 were proposed.

$$ND_6 = (CH_6 - CH_5)/(CH_6 + CH_5)$$

$$ND_7 = (CH_7 - CH_5)/(CH_7 + CH_5)$$

$$TVI_6 = (ND_6 + 0.5)^{1/2}$$

$$TVI_7 = (ND_7 + 0.5)^{1/2}$$

Our experience has been that the addition of 0.5 does not eliminate all negative values. We suggest the following computationally correct formulae:

$$\begin{aligned} \text{TVI6} &= (\text{ND6} + .5)/\text{ABS}(\text{ND6} + .5)[\text{ABS}(\text{ND6} + .5)]^{1/2} \\ \text{TVI7} &= (\text{ND7} + .5)/\text{ABS}(\text{ND7} + .5)[\text{ABS}(\text{ND7} + .5)]^{1/2} \end{aligned}$$

where ABS denotes absolute value, and 0/0 is set equal 1. In section 6, it is shown that these formulae are equivalent for decision making to the basic ratios R65 and R75. Therefore, their use can only be justified if either they improve the regression fit or they normalize the regression errors [Draper and Smith (1966)].

Kauth and Thomas (1976) proposed an orthogonal transformation of the original Landsat data space to a new four-dimensional space. They christened this transformation the tassel cap transformation and named the four new axes soil brightness (SBI), green vegetation (GVI), yellow stuff (YVI), and non-such (NSI). The names attached to the new axes indicate the characteristics the indices were intended to measure.

$$\text{SBI} = .332 \text{ CH4} + .603 \text{ CH5} + .675 \text{ CH6} + .262 \text{ CH7}$$

$$\text{GVI} = -.283 \text{ CH4} - .660 \text{ CH5} + .577 \text{ CH6} + .388 \text{ CH7}$$

$$\text{YVI} = -.899 \text{ CH4} + .428 \text{ CH5} + .076 \text{ CH6} - .041 \text{ CH7}$$

$$\text{NSI} = -.016 \text{ CH4} + .131 \text{ CH5} - .452 \text{ CH6} + .882 \text{ CH7}$$

Wheeler et al. (1976) and Misra et al. (1977) applied principal component analysis to Landsat data. The structure of the resulting transformation and the interpretation of the principal components are similar to those for the Kauth-Thomas transformation.

$$\text{MSBI} = .406 \text{ CH4} + .600 \text{ CH5} + .645 \text{ CH6} + .243 \text{ CH7}$$

$$\text{MGVI} = -.386 \text{ CH4} - .530 \text{ CH5} + .535 \text{ CH6} + .532 \text{ CH7}$$

$$\text{MYVI} = .723 \text{ CH4} - .597 \text{ CH5} + .206 \text{ CH6} - .278 \text{ CH7}$$

$$\text{MNSI} = .404 \text{ CH4} - .039 \text{ CH5} - .505 \text{ CH6} + .762 \text{ CH7}$$

Misra et al. (1977) proposed another linear transform, based on the idea of spectral brightness and contrast. Generalizations of spectral brightness and contrast were defined in spectral density space, then transformed back to count space. The first two components of the resulting transformation are similar to the first two components of the two preceding transformations.

$$SSBI = .437 CH4 + .564 CH5 + .661 CH6 + .233 CH7$$

$$SGVI = -.437 CH4 - .564 CH5 + .661 CH6 + .233 CH7$$

$$SYVI = -.437 CH4 + .564 CH5 - .661 CH6 + .233 CH7$$

$$SNSI = -.437 CH4 + .564 CH5 + .661 CH6 - .233 CH7$$

Richardson and Wiegand (1977) used the perpendicular distance to the "soil line" as an indicator of plant development. The "soil line", a two-dimensional analogue of the Kauth-Thomas SBI, was estimated by linear regression. Two perpendicular vegetation indices were proposed.

$$PVI7 = [(.355 CH7 - .149 CH5)^2 + (.355 CH5 - .852 CH7)^2]^{1/2}$$

$$PVI6 = [(-.498 - .457 CH5 + .498 CH6)^2 + (2.734 + .498 CH5 - .543 CH6)^2]^{1/2}$$

Evidently a minor error was made in the derivation of PVI6. The formula for PVI6 should be:

$$PVI6 = [(-2.507 - .457 CH5 + .498 CH6)^2 + (2.734 + .498 CH5 - .543 CH6)^2]^{1/2}$$

These formulae are computationally inefficient and do not distinguish right from left of the "soil line" (water from green stuff). The standard formula from analytic geometry for the perpendicular distance from a point to a line solves this difficulty [Salas and Hille (1978)].

$$PVI6 = (1.091 CH6 - CH5 - 5.49)/(1.091^2 + 1^2)^{1/2}$$

$$PVI7 = (2.4 CH7 - CH5 - .01)/(2.4^2 + 1^2)^{1/2}$$

The difference vegetation index (DVI), suggested by Richardson and Wiegand (1977) as computationally easier than PVI7, is essentially a rescaling of PVI7.

$$DVI = 2.4 \text{ CH7} - \text{CH5}$$

The Ashburn vegetation index [Ashburn (1979)] was suggested as a measure of green growing vegetation. The doubling of CH7 is to make the scale compatible; CH7 is 6-bit data and has one-half the range of the other three bands which are 8-bit data.

$$AVI = 2.0 \text{ CH7} - \text{CH5}$$

Colwell et al. (1979) proposed a vegetation indicator called greenness above bare soil (GRABS). This was another attempt to develop an indicator for which a threshold value could be specified for detecting green vegetation. The calculations were made using the Kauth-Thomas tassel cap transformation applied to sun-angle and haze-corrected data. The resulting index is quite similar to the GVI, since the contribution of SBI is less than 10 percent of GVI.

$$GRABS = GVI - .09178 \text{ SBI} + 5.58959$$

Kanemasu et al. (1977) regressed winter wheat leaf area measurements on MSS band ratios and produced the following regression equation.

$$\begin{aligned} ELAI = & 2.68 - 3.69 \text{ R45} - 2.31 \text{ R46} + 2.88 \text{ R47} + 0.43 \text{ R56} - 1.35 \text{ R57} \\ & + 3.07[\text{R45} - (.5 \text{ R47})(\text{R45})] \end{aligned}$$

Pollack and Kanemasu (1979) later used a larger data set plus stepwise regression and obtained another regression equation.

$$CLAI = .366 - 2.265 \text{ R46} - .431(\text{R45} - \text{R47})(\text{R45}) + 1.745 \text{ R45} + .057 \text{ PVI7}$$

Separate regression equations were also obtained for CLAI values above and below 0.5.

$$\text{LAI} = 1.903 - 1.135 R56 - .071(R45 - R47)R45 + .016 \text{ PVI}_6,$$

if CLAI is less than 0.5

$$\text{LAI} = -5.33 + .036 \text{ PVI}_7 + 6.54 \text{ TVI}_6,$$

if CLAI is greater than 0.5

The Foreign Crop Condition Assessment Division (FCCAD) of the Foreign Agricultural Service (FAS), Houston, Texas uses another leaf area model. We have been unable to find any reference to the development of this model.

$$\text{OLAI} = 41.325 R45 - 42.45 R46$$

Badhwar (1981) proposed a ratio of GVI to SBI as an indicator of crop discrimination. It will be shown in section 6 that this index is a generalization of a normalized difference.

$$\text{GVSB} = \text{GVI/SBI}$$

Craig Wiegand (personal communication) suggested converting reflectance values to radiances. Linear transformations were used to change from reflectance to radiance values. Ratio and normalized difference formulae were also created using the radiance values.

$$\text{RAD5} = 0.0157 \text{ CH5} \quad \text{for Landsat 1}$$

$$= 0.0134 \text{ CH5} + 0.06 \quad \text{for Landsat 2}$$

$$= 0.0139 \text{ CH5} + 0.03 \quad \text{for Landsat 3}$$

$$\text{RAD7} = 0.0730 \text{ CH7} \quad \text{for Landsat 1}$$

$$= 0.0603 \text{ CH7} + 0.11 \quad \text{for Landsat 2}$$

$$= 0.0603 \text{ CH7} + 0.03 \quad \text{for Landsat 3}$$

$$\text{RADR75} = \text{RAD7/RAD5}$$

$$\text{NDRAD} = (\text{RAD7} - \text{RAD5}) / (\text{RAD7} + \text{RAD5})$$

Thompson and Wehmanen (1978) proposed a technique utilizing transformed Landsat digital data to indicate when agricultural vegetation is undergoing moisture stress. The screening number or green number (GIN) was proposed to estimate the percentage of land in an area with a "healthy" cover of vegetation. A "soil line" is determined by inspecting the channel data and discarding data not considered reasonable for agricultural data. The "soil line" is then evaluated as the minimum value remaining in CH5 and subtracted from GVI to obtain GIN.

$$GIN = GVI - \text{soil line}$$

The data sets included in this study did not permit the computation of GIN. However, GIN is a linear transformation of GVI.

4. EVALUATION OF VEGETATION INDICES

4.1 BACKGROUND

Richardson and Wiegand (1977) correlated eight VIs (GVI, DVI, SBI, PVI6, PVI7, TVI6, TVI7, and R57) with four plant component variables (crop cover, shadow cover, plant height, and leaf area index). The correlation coefficients obtained by plant component with the VIs (excluding SBI) were very similar. Later, Wiegand et al. (1979) correlated leaf area indices for winter wheat fields to five VIs (TVI7, TVI6, PVI7, PVI6, and GVI). The correlation coefficients by field and even between fields were similar.

Aaronson et al. (1979) studied the similarities and differences among seven VIs (AVI, DVI, GVI, OLAI, PVI7, TVI7, and KVI). The obtained correlation coefficients ranged from 0.8 to 1.0 and were stable from spring greenup to harvest. Aaronson and Davis (1979) later used a large data set, which included vegetation measurements and several VIs, to study interrelationships. The VIs (AVI, DVI, GVI, OLAI, KVI, PVI6, PVI7, TVI6, and TVI7) were correlated against each other and against vegetation measures such as plant height from tillering through harvest. The correlation coefficients between the VIs ranged from 0.81 to 1.00, and those between VIs and vegetation measures were similar.

4.2 CLUSTER ANALYSIS OF VI

The similarity between the VIs was first studied using the BMDP program P1M, cluster analysis of variables (Dixon and Brown, 1979) and the data set described in appendix A. The absolute value of the bivariate correlations was used as the measure of distance between VIs, and the average distance between elements was used as the between cluster distance. Similar results were obtained using other standard distance measures.

This procedure separated the VIs into two large clusters plus a number of small clusters. One large cluster contained VIs based on MSS bands 5 and 7, which included AVI, PVI7, R75, TVI7, and ND7. The other large cluster contained VIs, based on MSS bands 5 and 6, and a few VIs involving three or all four bands, which included GRABS, CLAI, OLAI, R65, TVI6, ND6, GVI, MGVI, PVI6, and SGVI. The VIs within these two clusters had absolute

simple linear correlations greater than 0.90, with most greater than 0.95. The elements of these two large clusters are correlated at 0.8 or higher. Three smaller clusters readily apparent were: (NSI, R76), (R64, R74), and (SBI, MSBI, SSBI, SNSI). This clustering is applicable to the period from spring greenup to harvest. There are some clusters, however, which have high correlations for the whole season, especially those involving bands 5 and 7. The cluster trees on which this discussion is based are attached as appendix B.

Some VIs were not used in the cluster analysis because of their known relationships to others. The inverse ratios R54, R46, R47, R56, R67, and R57 were not used. DVI was discarded because of its relationship to PVI7, as were RAD5, RAD7, RADR75, and NDRAD because of the linear relationships to CH5, CH7, R75, and ND7.

5. VEGETATION INDICES EQUIVALENCE

In this section, a definition of VI equivalence will be developed. This permits a natural categorization of the VIs. VIs are functions which associate a real value to the four-dimensional Landsat reflectance measurement vector, (MSS4, MSS5, MSS6, MSS7). Thus, it will be convenient to employ standard function notation: $f:S_1 \rightarrow S_2$ denotes a function from the set S_1 into the set S_2 ; $f(X)$, the value of f at the point (X) of S_1 ; $\text{Dom}(f)$, the domain of f ; $\text{Ran}(f)$, the range of f ; and $f^{-1}:S_2 \rightarrow S_1$, the inverse of f when it exists. The inverse exists if, and only if, f is one-to-one and onto. The composition of two functions has an inverse if, and only if, both functions have inverses; in which case $(f \circ g)^{-1} = g^{-1} \circ f^{-1}$.

It might seem that VI equivalence should correspond to function equality; i.e., $V_1 = V_2$ if, and only if, $V_1(X) = V_2(X)$ for each Landsat reflectance value X . However, this requirement is too restrictive because it involves only the VIs output and ignores the decisions made on the basis of this output. Since vegetation indices are formulae used in making decisions about crop characteristics and conditions, it seems appropriate to say that two VIs are equivalent if the same decision results regardless of the VI employed. This means that two VIs, V_1 and V_2 , are equivalent for making the set of decisions D if, and only if for every decision rule---
 $d_1: \text{Ran}(V_1) \rightarrow D$, there corresponds a decision rule $d_2: \text{Ran}(V_2) \rightarrow D$ such that the decision, based on d_2 and V_2 , is the same as the decision based on d_1 and V_1 for all Landsat reflectance measurements X ; that is, $d_1(V_1(X)) = d_2(V_2(X))$ for each X . It is easy to see that the two vegetation indices, V_1 and V_2 , are equivalent if, and only if, there exists a one-to-one onto function

$T: \text{Ran}(V_1) \rightarrow \text{Ran}(V_2)$ such that $T \circ V_1 = V_2$. This implies that a decision d results from the same set of Landsat reflectance regardless of which VI is used; that is

$$V_1^{-1}[T^{-1}(d)] = (T \circ V_1)^{-1}(d) = V_2^{-1}(d) \quad (\text{Equation 1})$$

for each decision d in D , where the superscript -1 indicates the inverse image of d under the given function. The relationship defined is an equivalence relation on the set of vegetation indices; that is,

- i. Each VI is equivalent to itself: Reflexive property.
- ii. If V_1 is equivalent to V_2 , then V_2 is equivalent to V_1 : Symmetric property.
- iii. If V_1 is equivalent to V_2 , and V_2 is equivalent to V_3 , then V_1 is equivalent to V_3 : Transitive property.

These properties are important because they permit one to avoid many tedious computations.

A number of studies have investigated the transformed vegetation indices TVI6 and TVI7 and the corresponding ratios R65 and R75 as predictors of biomass, leaf area index, plant height, and percent ground cover. The predictive ability of TVI6 and R65 or TVI7 and R75 are similar as evidenced by the estimated correlation coefficient. We now show that the transformed vegetation index and its generalizations are equivalent to the corresponding ratios. This example makes clear not only the algebraic and geometric meaning of VI equivalence but also demonstrates the utility and appropriateness of this definition.

Let a and b be positive constants, and define the functions f , g , and T by

$$\begin{aligned}f(x_5, x_7) &= (ax_7 - bx_5)/(ax_7 + bx_5) \\g(x_5, x_7) &= x_7/x_5 \\T(y) &= (b/a)[(1 + y)/(1 - y)]\end{aligned}$$

for x_5 and x_7 positive and $\text{ABS}(y)$ less than one. Observe that T is invertible; in fact

$$T^{-1}(z) = (az - b)/(az + b) \text{ for } z \text{ positive}$$

Thus, f and g are equivalent and the values of f can be computed from the values of g and vice versa.

$$(T \circ f)(x_5, x_7) = g(x_5, x_7)$$
$$(T^{-1} \circ g)(x_5, x_7) = f(x_5, x_7)$$

Let k and p be real, and define the functions $G: (-1, 1) \rightarrow (k-1, k+1)$ and $H: (k-1, k+1) \rightarrow (L, U)$ by

$$G(v) = v + k$$
$$H(w) = w[AB(v)]^{p-1}, \text{ for}$$

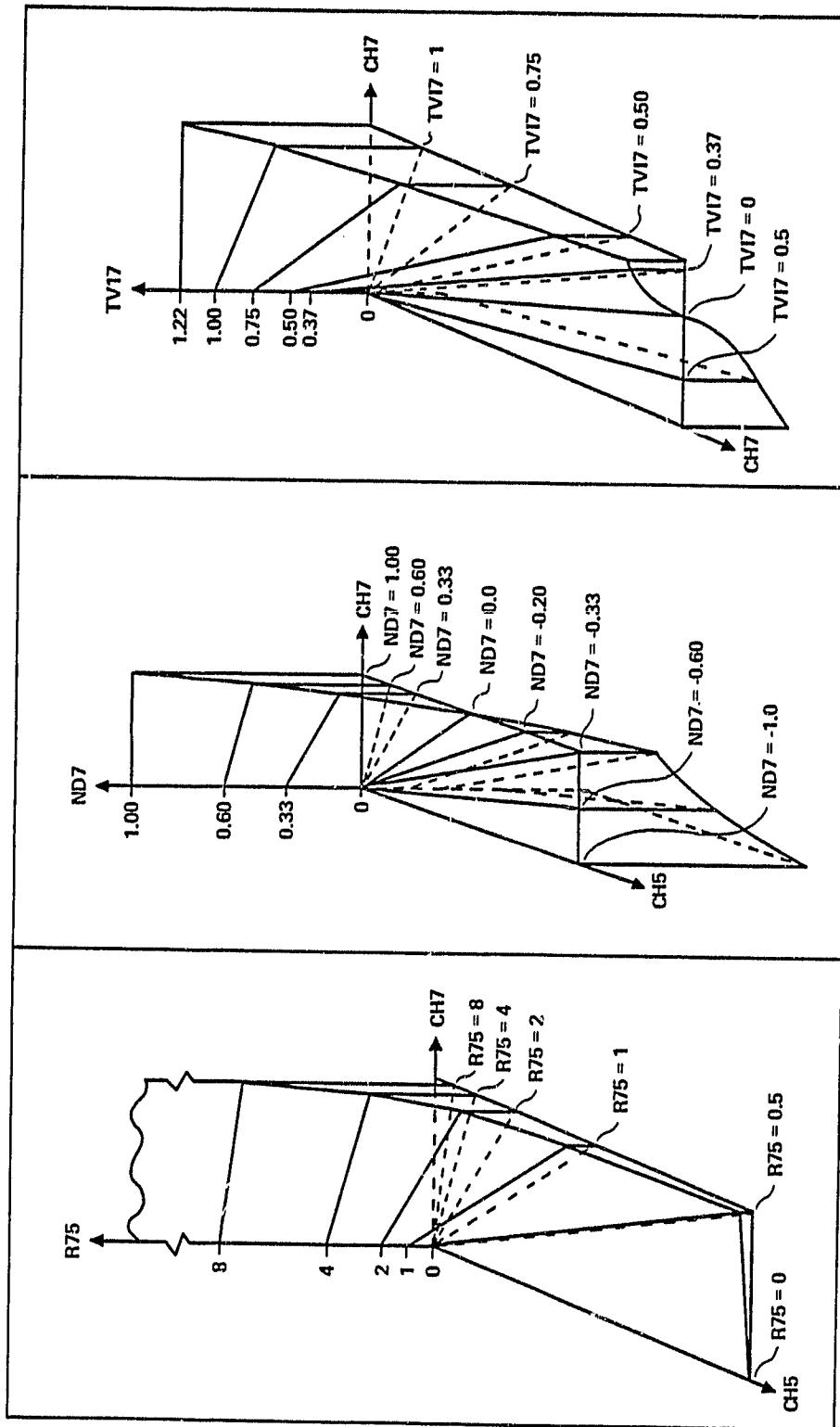
w between $k-1$ and $k+1$, $L = (k-1)[AB(k-1)]^{p-1}$, $U = (k+1)[AB(k+1)]^{p-1}$, for $AB(v)$ less than one, and 0/0 defined as 1. It is easy to verify that G and H are one-to-one and onto and that

$$(H \circ G \circ T^{-1} \circ g)(x_5, x_7) = (f(x_5, x_7) + k)[AB(f(x_5, x_7) + k)]^{p-1}.$$

Taking $k = p = 1/2$ and $a = b = 1$ shows that the transformed vegetation index, TVI7, is equivalent to the seven-five ratio, R75.

$$(H \circ G \circ T^{-1}) R75 = TVI7$$

Equivalence of VIs means their response surfaces determine precisely the same partition of the reflectance measurement space (equation 1). Elements of this partition are referred to as decision classes. Representative response surfaces and equivalence classes associated with R75, ND7, and TVI7 are illustrated in figures 2a, 2b, and 2c. Similar graphs for other popular indices are attached as appendix C. The nonlinear algebraic relationships exhibited among R75, ND7, and TVI7 are illustrated graphically in figure 3. Similar graphs for other indices are studied in appendix D.



(a) Associated with R75 (b) Associated with ND7 (c) Associated with TVI7

Figure 2. Response surface and equivalence classes.

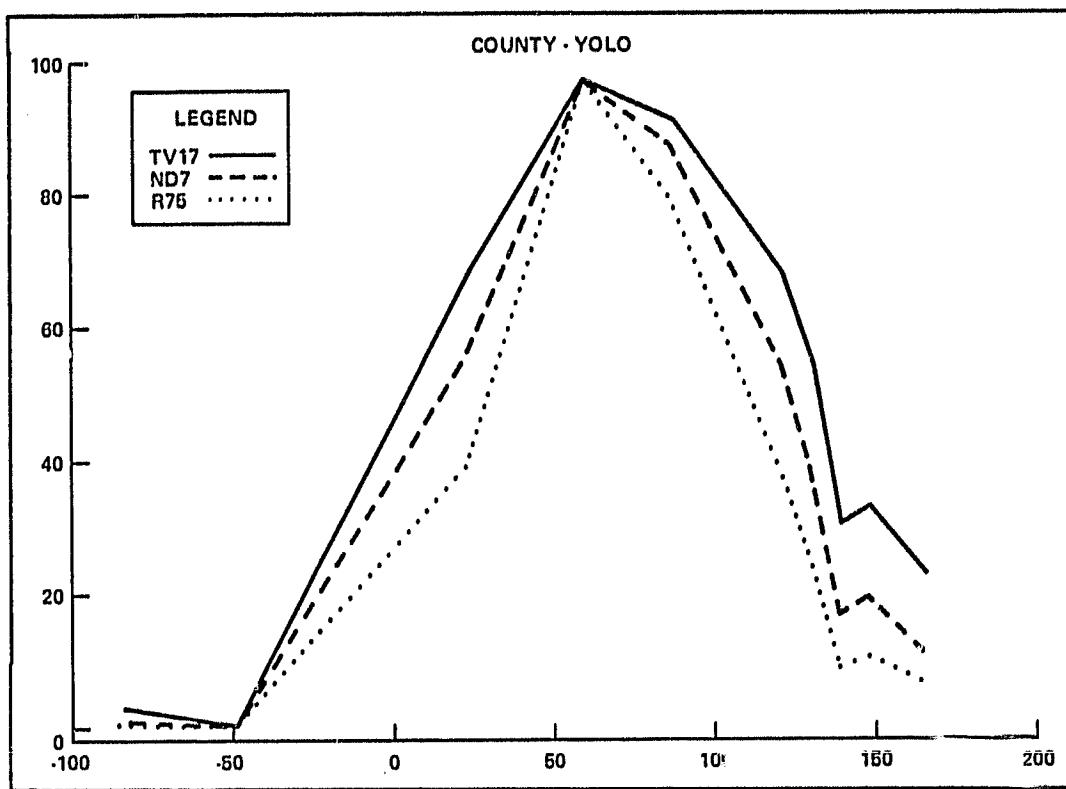


Figure 3. R75, ND7, and TVI7 versus time using data listed in Appendix A.
All VI values have been rescaled 0 to 100.

As a further illustration of the utility of VI equivalence, GVSB is shown to be approximated by ND6. Thus, the more complicated GVSB can be expected to provide approximately the same information about crop condition as the simple ratio R65.

Using Landsat data described in appendix A, the following estimates were obtained.

GRANT AREA DATA / N = 6084

Variable	N	Mean	Std. Dev.
CH4	6084	23.2	7.2
CH5	6084	26.7	10.0
CH6	6084	41.4	15.9
CH7	6084	17.5	6.3

CORRELATION COEFFICIENTS

Variable	CH4	CH5	CH6	CH7
CH4	1.00			
CH5	0.86	1.00		
CH6	0.73	0.64	1.00	
CH7	0.67	0.50	0.96	1.00

From these estimates, one easily obtains the regression equations

$$CH7 = .4100 CH6 + .5100$$

$$CH4 = .6236 CH5 + 6.564$$

Naively substituting into the formulae for GVI and SBI gives the following formulae.

$$EGVI = .74 (CH6 - 1.14 CH5 + .03)$$

$$ESBI = .78 (CH6 + 1.03 CH5 + 2.96)$$

These approximations are illustrated in figures 4 and 5. Using the information in the above tables pertaining to the expected range of the data, it is easy to see that a rough approximation for GVSB is:

$$EGVSB = (CH6 - 1.14 CH5)/(CH6 + 1.03 CH5)$$

which is approximately ND6. In fact, let

$$h(v) = (b + vd)/(a - vc)$$

$$k(x,y) = (ax - by)/(cx + dy)$$

$$r(x,y) = x/y,$$

$$\text{then } h(k(x,y)) = x/y = r(x,y)$$

Thus, the estimate, EGVSB, is equivalent to R65 and ND6. These relationships are illustrated graphically in figure 6. Graphs similar to figures 4, 5 and 6 for other sites are contained in appendix E.

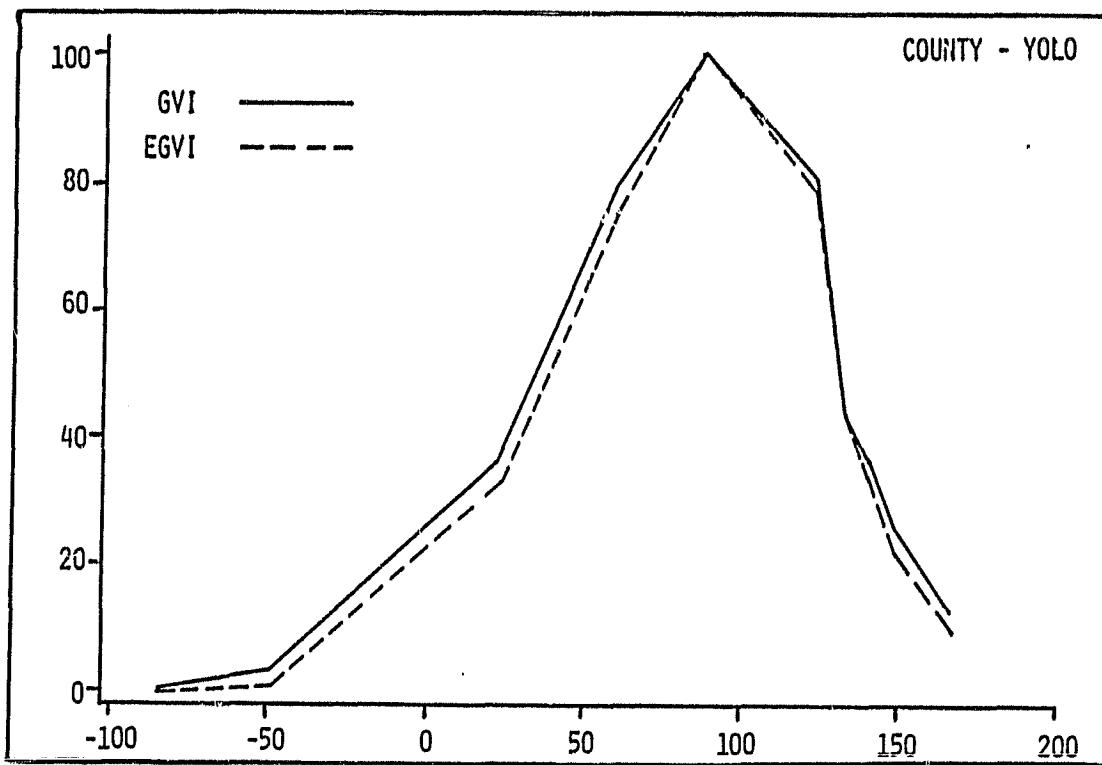


Figure 4. GVI and EGVII versus time using data listed in Appendix A. All VI values have been rescaled 0 to 100.

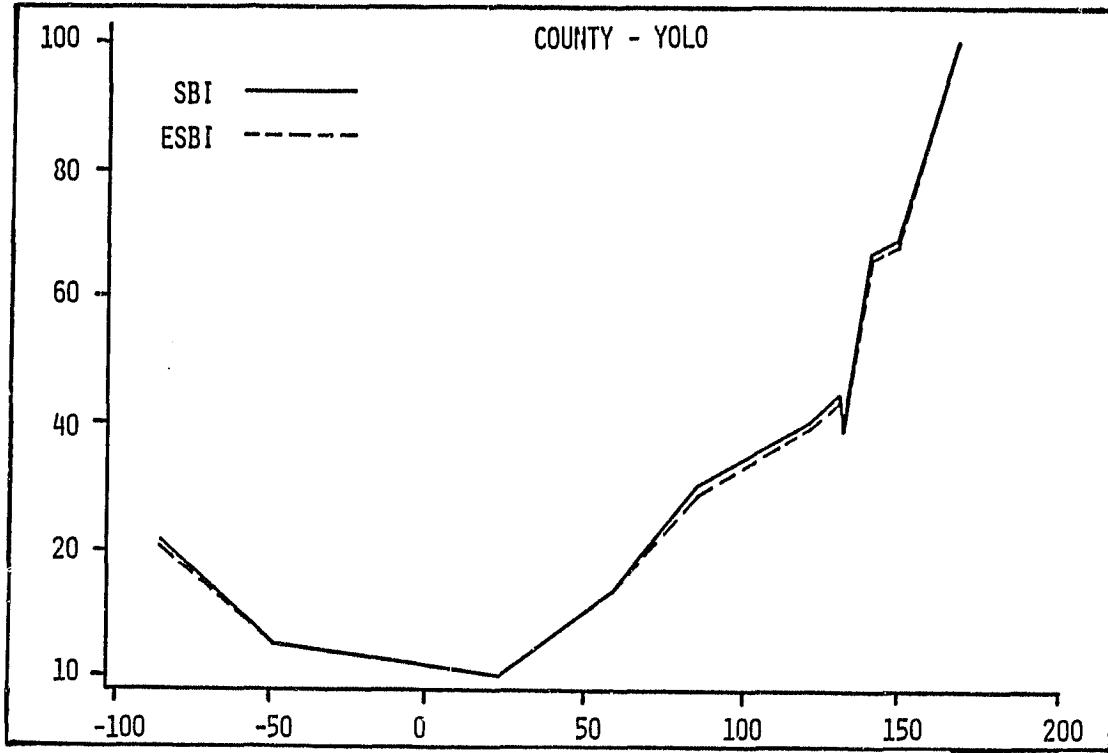


Figure 5. SBI and ESBII versus time using data listed in Appendix A. All VI values have been rescaled from 0 to 100.

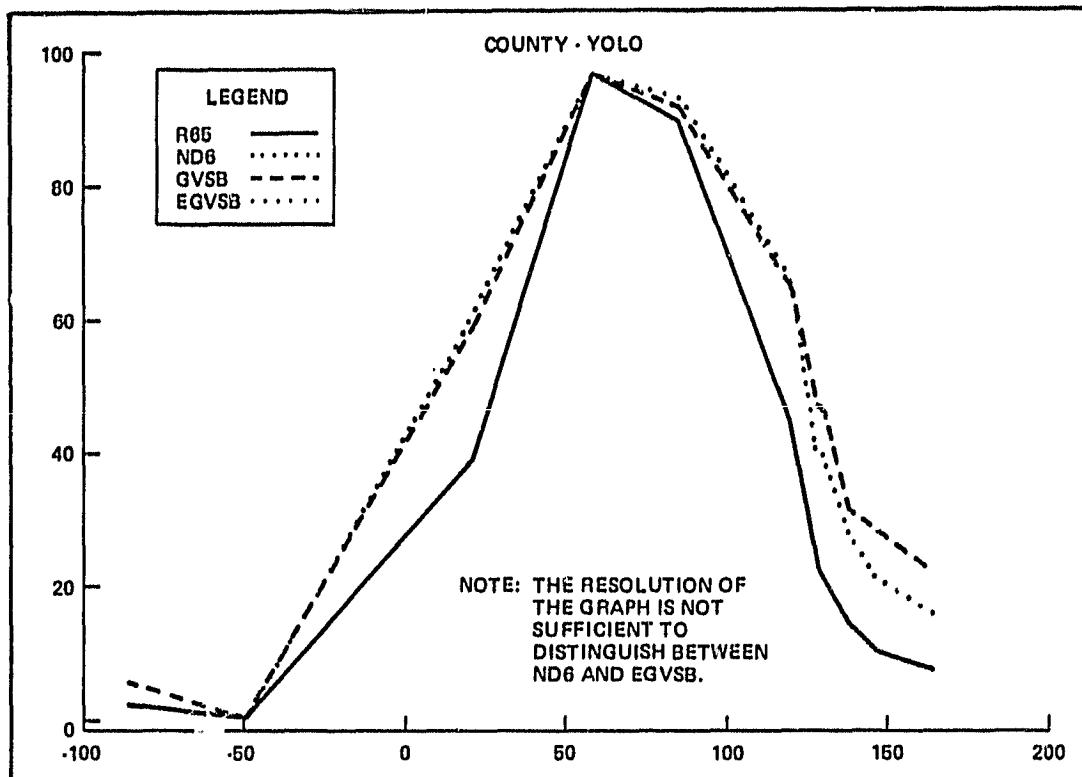


Figure 6. R65, GVSB, ND6, and EGVSB versus time using data listed in Appendix A. All VI values have been rescaled 0 to 100.

6. SUMMARY AND CONCLUSIONS

Other researchers have studied the relationships among a few of the VIs considered in this report. Past work has been based exclusively on correlation analysis. Aaronson and Davis (1979) showed conclusively that, during the spring greenup to harvest phase of the crop season, the VIs used operationally by The Foreign Agriculture Service (FAS)/Foreign Crop Condition Assessment Division (FCCAD) were highly correlated and had similar correlations with various plant components such as biomass, plant height, etc.

This study extends analysis to include all VIs found in the literature. Techniques used to investigate relationships between the VIs included variable clustering by correlation, graphical presentations, and functional equivalence for decision making. Variable clustering separated out two large clusters of VIs. One cluster contained those VIs which used channels 5 and 7 data. The other cluster contained VIs using channels 5 and 6 data plus some VIs using all four channels of data. The variable clustering technique also showed that these two clusters were highly correlated. The relationships were stable during the spring greenup to harvest period of the crop season. Graphical presentations reinforced the clustering results, illustrating the relationships over time and through response surfaces. Mathematical techniques were used to formalize the idea of VI equivalence. This equivalence was used to confirm relationships observed earlier and to investigate less apparent relationships.

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APPENDIX A

DATA SET DESCRIPTIONS

The data set consisted of Landsat acquisitions from six different sites for the 1977-78 crop year. The six sites were Finney County, Kansas; Grant County, Oklahoma; Greeley County, Kansas; Keith County, Nebraska; Washington County, Colorado; and Yolo County, California. The Finney County site consists of an area 40 pixels by 26 lines or 1040 pixels of data. The Yolo County site consists of an area 40 pixels by 40 lines or 1600 pixels of data. All other sites consist of an area 26 pixels by 26 lines or 676 pixels of data.

One field within each area was also selected, since it had already been defined for another project. The Finney, Grant, Greeley, Keith and Washington County fields were winter wheat and consisted of 85, 79, 67, 100 and 53 pixels of data respectively. The Yolo county field was a barley field and consisted of 500 pixels of data.

The data sets are identified by county, acquisition date and Landsat satellite as follows:

Finney	Keith	Yolo
9-22-77 (2)	10-12-77 (2)	10-07-77 (2)
9-23-77 (2)	11-17-77 (2)	11-12-77 (2)
10-11-77 (2)	12-04-77 (2)	1-23-78 (2)
11-16-77 (2)	3-22-78 (2)	2-28-78 (2)
1-08-78 (2)	3-31-78 (3)	3-27-78 (3)
3-04-78 (2)	4-28-78 (2)	5-02-78 (3)
3-31-78 (3)	5-15-78 (2)	5-11-78 (2)
5-15-78 (2)	5-16-78 (2)	5-12-78 (2)
5-23-78 (3)	5-25-78 (3)	5-20-78 (3)
6-01-78 (2)	6-11-78 (3)	5-29-78 (2)
6-11-78 (3)	6-21-78 (2)	6-16-78 (2)
6-11-78 (3)	6-29-78 (2)	
6-19-78 (2)	7-27-78 (2)	
6-29-78 (3)	8-13-78 (2)	
7-26-78 (2)	8-14-78 (2)	

Grant	Greeley	Washington
10-08-77 (2)	10-11-77 (2)	10-12-77 (2)
11-13-77 (2)	11-16-77 (2)	11-17-77 (2)
12-19-77 (2)	3-22-78 (2)	3-24-78 (2)
3-09-78 (3)	3-31-78 (3)	4-11-78 (2)
3-28-78 (3)	4-27-78 (2)	4-28-78 (2)
4-06-78 (2)	5-15-78 (2)	5-16-78 (2)
4-24-78 (2)	5-25-78 (3)	5-26-78 (3)
5-30-78 (2)	6-11-78 (3)	6-12-78 (3)
6-17-78 (2)	6-29-78 (3)	

The data were calibrated as follows to all look like Landsat II LACIE segment data. Data from Landsat 2 EROS full frame CCT's were calibrated using the calibration below (NASA (1976) and RICE (1977)).

$$\begin{aligned}
 CH4 &= CH4 * 1.275 - 1.445 \\
 CH5 &= CH5 * 1.141 - 2.712 \\
 CH6 &= CH6 * 1.098 - 2.950 \\
 CH7 &= CH7 * 0.948 + 0.446
 \end{aligned}$$

Data from Landsat 3 were calibrated using the following calibrations which were developed by Wehmanen (1978).

$$\begin{aligned}
 CH4 &= CH4 * 1.161 \\
 CH5 &= CH5 * 1.230 \\
 CH6 &= CH6 * 1.246 \\
 CH7 &= CH7 * 1.062
 \end{aligned}$$

The field data were adjusted using the X-STAR haze correction procedure developed by Lambeck (1979). Pixel data screened as shadow, water, haze, cloud or garbled through this procedure were deleted from further use. Sun angle correction was also applied which is part of the X-STAR haze correction algorithm.

A partial listing containing descriptive statistics of MSS data by band, date, field or area, and county are attached.

The dates are Julian dates where positive dates are for 1978 and negative dates are for 1977 and indicate the number of days from end of year. The Julian date for 1977 may be obtained by adding 365 to each negative date.

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Keith County Field Data by Julian Date

variable	n	mean	standard deviation	minimum value	maximum value	std error of mean
----- DATE=81 -----						
CH4	55	35.33	3.88	26.00	43.00	0.42
CH5	85	42.07	4.50	28.00	55.00	0.52
CH6	85	48.19	5.34	29.00	57.00	0.58
CH7	85	20.19	2.13	11.00	24.00	0.23
----- DATE=90 -----						
CH4	95	30.47	2.30	22.00	37.15	0.24
CH5	95	34.57	3.73	24.60	44.28	0.38
CH6	95	51.13	5.45	32.40	63.55	0.56
CH7	95	20.37	2.51	10.62	23.36	0.26
----- DATE=118 -----						
CH4	99	18.61	1.62	16.00	23.00	0.16
CH5	99	15.49	2.49	11.00	23.00	0.25
CH6	99	46.53	3.70	36.00	53.00	0.37
CH7	99	23.67	2.29	18.00	28.00	0.23
----- DATE=135 -----						
CH4	95	38.71	2.92	25.00	42.00	0.30
CH5	95	28.76	4.39	21.00	48.00	0.50
CH6	95	61.62	2.61	56.00	68.00	0.27
CH7	95	29.51	2.16	24.00	34.00	0.22
----- DATE=136 -----						
CH4	100	25.16	3.22	20.00	35.00	0.32
CH5	100	22.53	4.41	15.00	38.00	0.44
CH6	100	56.42	3.19	47.00	65.00	0.32
CH7	100	27.42	2.21	22.00	33.00	0.22
----- DATE=145 -----						
CH4	100	29.33	3.66	22.06	44.12	0.37
CH5	100	27.06	5.67	18.45	49.20	0.57
CH6	100	62.66	3.86	53.58	69.78	0.39
CH7	100	27.99	2.40	23.36	33.98	0.24
----- DATE=162 -----						
CH4	100	24.98	2.78	19.74	34.83	0.28
CH5	100	35.79	4.82	15.99	43.05	0.48
CH6	100	60.33	4.79	52.33	74.76	0.48
CH7	100	30.81	3.12	25.49	38.23	0.31

Keith County Field Data by Julian Date

variable	n	mean	standard deviation	minimum value	maximum value	std err. of mean
----- DATE=178 -----						
CH4	100	28.59	2.64	24.05	35.53	0.26
CH5	100	30.63	3.55	23.53	41.79	0.35
CH6	100	51.87	5.00	45.36	66.22	0.50
CH7	100	23.25	2.47	17.51	28.89	0.25
----- DATE=180 -----						
CH4	100	33.83	1.69	29.82	35.99	0.17
CH5	100	49.73	3.44	39.36	57.81	0.34
CH6	100	63.23	3.12	57.32	72.27	0.31
CH7	100	26.67	1.63	23.36	33.98	0.16
----- DATE=208 -----						
CH4	100	31.54	3.15	26.00	38.00	0.32
CH5	100	40.23	5.10	29.00	48.00	0.51
CH6	100	46.02	3.98	37.00	58.00	0.40
CH7	100	19.83	1.66	15.00	27.00	0.19
----- DATE=-80 -----						
CH4	100	22.35	2.17	16.40	26.60	0.22
CH5	100	26.82	3.40	18.97	32.66	0.34
CH6	100	37.27	4.08	24.50	48.66	0.41
CH7	100	17.47	1.76	10.87	20.35	0.18
----- DATE=-44 -----						
CH4	100	11.32	1.17	10.03	15.13	0.12
CH5	100	11.45	2.21	7.56	20.11	0.22
CH6	100	27.52	2.27	16.31	33.28	0.23
CH7	100	14.32	1.32	8.03	16.56	0.13
----- DATE=-27 -----						
CH4	95	9.60	1.82	7.00	14.00	0.12
CH5	95	9.68	1.69	7.00	14.00	0.17
CH6	95	13.11	2.29	9.00	19.00	0.24
CH7	95	7.04	1.02	5.00	9.00	0.10

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Keith County Area Data by Julian Date

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERR. + OF MEAN
----- DATE=81 -----						
CH4	676	36.88	4.36	22.00	52.00	0.19
CH5	676	44.92	6.32	28.00	62.00	0.24
CH6	676	49.46	5.49	39.00	64.00	0.21
CH7	676	20.49	2.05	11.00	25.00	0.08
----- DATE=90 -----						
CH4	676	34.06	4.01	22.22	47.60	0.15
CH5	676	40.93	7.30	24.60	63.96	0.28
CH6	676	51.00	7.66	32.40	72.27	0.29
CH7	676	19.29	2.97	10.62	23.49	0.11
----- DATE=118 -----						
CH4	676	22.74	4.08	16.00	34.00	0.16
CH5	676	24.83	7.44	11.00	48.00	0.29
CH6	676	37.69	8.31	12.00	54.00	0.32
CH7	676	17.47	4.59	9.00	28.00	0.19
----- DATE=135 -----						
CH4	676	38.51	6.05	25.00	52.00	0.23
CH5	676	42.42	10.54	21.00	65.00	0.41
CH6	676	57.94	4.72	44.00	73.00	0.18
CH7	676	25.04	3.31	19.00	34.00	0.13
----- DATE=136 -----						
CH4	676	32.91	5.67	20.00	46.00	0.23
CH5	676	35.89	10.28	15.00	56.00	0.40
CH6	676	50.51	5.10	36.00	65.00	0.20
CH7	676	21.36	3.64	16.00	33.00	0.15
----- DATE=145 -----						
CH4	676	38.66	7.46	22.06	52.24	0.29
CH5	676	44.74	14.03	18.45	71.34	0.54
CH6	676	64.60	5.53	49.64	78.50	0.21
CH7	676	25.23	2.12	20.18	33.98	0.08
----- DATE=162 -----						
CH4	676	34.54	8.39	19.74	51.08	0.32
CH5	676	46.15	16.53	15.99	76.26	0.64
CH6	676	66.45	11.53	42.36	98.96	0.44
CH7	676	30.25	4.38	22.30	38.23	0.16

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Keith County Area Data by Julian Date

CHARABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN
----- DATE=172 -----						
CH4	676	30.78	3.90	21.50	41.90	0.15
CH5	676	32.77	4.55	15.54	47.49	0.25
CH6	676	54.12	5.73	24.87	78.62	0.22
CH7	676	20.75	2.61	15.67	30.64	0.11
----- DATE=180 -----						
CH4	676	31.49	4.14	26.90	42.96	0.16
CH5	676	41.62	12.31	19.68	61.50	0.47
CH6	676	65.67	6.30	47.35	80.99	0.24
CH7	676	29.31	5.03	19.12	40.36	0.19
----- DATE=208 -----						
CH4	676	29.26	7.69	17.00	52.00	0.30
CH5	676	32.77	4.61	12.00	67.00	0.56
CH6	676	55.45	8.78	32.00	74.00	0.34
CH7	676	25.66	6.65	12.00	39.00	0.26
----- DATE=225 -----						
CH4	676	39.96	5.96	17.00	42.00	0.23
CH5	676	32.18	11.39	14.00	54.00	0.44
CH6	676	51.92	8.25	32.00	71.00	0.32
CH7	676	23.96	6.40	12.00	37.00	0.25
----- DATE=226 -----						
CH4	676	27.46	5.60	16.00	38.00	0.22
CH5	676	29.81	10.73	13.00	49.00	0.41
CH6	676	48.61	9.14	31.00	68.00	0.31
CH7	676	22.13	6.33	13.00	34.00	0.24
----- DATE=-80 -----						
CH4	676	22.59	4.62	13.65	32.99	0.18
CH5	676	29.37	7.80	16.68	48.63	0.30
CH6	676	37.91	7.40	17.91	56.34	0.28
CH7	676	16.64	2.99	9.03	23.25	0.12
----- DATE=-44 -----						
CH4	676	14.68	3.21	8.75	22.78	0.12
CH5	676	18.56	6.64	7.55	32.66	0.26
CH6	676	26.94	4.79	12.42	39.87	0.18
CH7	676	11.86	2.33	4.29	17.57	0.09

Keith County Area Data by Julian Date

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN
----- DATE=27 -----						
CH4	676	10.75	1.67	6.00	15.00	0.06
CH5	676	11.97	2.56	5.00	20.00	0.10
CH6	676	12.59	3.32	6.00	22.00	0.13
CH7	676	6.21	1.63	3.00	11.00	0.06

Yolo County Field Data by Julian Date

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN
----- DATE=23 -----						
CH4	465	12.81	1.13	8.75	15.13	0.05
CH5	465	11.34	1.91	7.56	15.54	0.09
CH6	465	23.37	3.87	12.42	33.28	0.18
CH7	465	10.81	1.96	6.13	16.56	0.09
----- DATE=59 -----						
CH4	465	16.51	1.48	12.00	22.00	0.07
CH5	465	11.95	2.11	8.00	23.00	0.10
CH6	465	45.78	5.86	26.00	62.00	0.27
CH7	465	21.71	2.28	12.00	32.00	0.15
----- DATE=86 -----						
CH4	485	24.04	1.71	19.58	33.67	0.08
CH5	485	17.91	3.15	12.30	34.44	0.14
CH6	485	64.80	7.69	39.87	88.47	0.36
CH7	485	27.87	4.14	15.93	40.36	0.19
----- DATE=122 -----						
CH4	495	32.90	2.39	26.70	41.80	0.11
CH5	495	31.04	2.39	22.14	55.35	0.15
CH6	495	70.32	5.21	54.82	85.97	0.23
CH7	495	28.72	2.02	19.12	35.05	0.09

Yolo County Field Data by Julian Date

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD. ERROR OF MEAN
----- DATE=131 -----						
CH4	500	34.34	3.87	26.00	43.00	0.15
CH5	500	41.36	6.67	26.00	61.00	0.30
CH6	500	55.86	5.25	54.00	61.00	0.23
CH7	500	29.86	1.91	25.00	36.00	0.09
----- DATE=132 -----						
CH4	500	31.31	3.50	24.00	41.00	0.16
CH5	500	38.98	6.78	23.00	55.00	0.30
CH6	500	60.50	4.86	51.00	77.00	0.22
CH7	500	27.24	1.90	22.00	33.00	0.08
----- DATE=140 -----						
CH4	500	47.19	3.06	40.63	56.69	0.14
CH5	500	61.81	6.78	43.05	78.72	0.30
CH6	500	83.31	3.93	74.76	97.19	0.18
CH7	500	31.02	1.29	27.61	36.11	0.06
----- DATE=149 -----						
CH4	500	47.48	6.34	32.98	71.23	0.28
CH5	500	66.66	11.46	39.50	104.54	0.51
CH6	500	81.69	8.94	67.32	114.54	0.40
CH7	500	34.62	2.58	29.63	45.00	0.13
----- DATE=167 -----						
CH4	500	62.38	7.06	59.35	75.05	0.32
CH5	500	94.10	12.13	52.06	115.95	0.54
CH6	500	106.90	10.01	73.91	128.61	0.45
CH7	500	42.69	2.93	31.73	48.79	0.13
----- DATE=-85 -----						
CH4	285	28.22	4.62	20.23	48.63	0.27
CH5	285	34.54	6.54	20.11	55.48	0.39
CH6	285	34.37	7.64	16.81	57.44	0.45
CH7	285	12.93	2.85	7.08	21.30	0.17
----- DATE=-49 -----						
CH4	320	19.10	2.71	12.58	27.89	0.15
CH5	320	22.56	4.63	12.12	34.94	0.26
CH6	320	21.04	5.81	9.13	35.48	0.32
CH7	320	8.27	1.74	4.24	12.77	0.10

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Yolo County Area Data by Julian Date

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN
----- DATE=23 -----						
CH4	1640	12.78	1.51	7.48	17.68	0.04
CH5	1640	11.15	2.45	4.13	21.25	0.06
CH6	1640	23.22	5.74	4.74	46.46	0.14
CH7	1640	9.65	2.87	2.49	21.36	0.07
----- DATE=59 -----						
CH4	1640	16.66	1.78	6.00	27.00	0.04
CH5	1640	12.54	2.28	6.00	28.00	0.06
CH6	1640	42.31	7.95	16.00	68.00	0.20
CH7	1640	19.86	4.33	7.00	34.00	0.11
----- DATE=86 -----						
CH4	1640	25.90	3.90	18.58	41.00	0.10
CH5	1640	21.57	7.24	12.30	54.12	0.18
CH6	1640	60.24	10.62	33.64	88.47	0.26
CH7	1640	25.01	5.68	10.62	40.36	0.15
----- DATE=122 -----						
CH4	1640	34.41	3.99	25.54	49.92	0.10
CH5	1640	34.14	7.14	20.91	63.96	0.18
CH6	1640	68.45	6.60	41.12	85.97	0.16
CH7	1640	27.17	3.79	12.81	36.11	0.09
----- DATE=131 -----						
CH4	1640	35.03	4.24	24.00	50.00	0.10
CH5	1640	41.35	7.53	20.00	63.00	0.19
CH6	1640	61.97	8.23	36.00	82.00	0.20
CH7	1640	27.53	4.80	13.00	39.00	0.12
----- DATE=132 -----						
CH4	1640	31.86	4.32	19.00	47.00	0.11
CH5	1640	38.69	7.64	15.00	58.00	0.19
CH6	1640	57.21	8.42	31.00	77.00	0.21
CH7	1640	25.10	4.91	12.00	38.00	0.12
----- DATE=140 -----						
CH4	1640	47.83	3.56	37.15	56.89	0.09
CH5	1640	61.80	8.10	36.90	78.72	0.20
CH6	1640	90.63	7.99	51.09	98.43	0.20
CH7	1640	29.42	4.09	18.05	37.17	0.10

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Yolo County Area Data by Julian Date

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERR CR OF MEAN
----- DATE=149 -----						
CH4	1640	46.49	5.69	31.70	71.23	0.14
CH5	1640	62.52	12.05	32.65	104.54	0.39
CH6	1640	75.21	12.55	38.77	114.54	0.31
CH7	1640	30.56	6.19	13.77	45.06	0.15
----- DATE=167 -----						
CH4	1640	53.56	8.98	34.25	75.05	0.22
CH5	1640	77.99	17.79	37.22	115.95	0.44
CH6	1640	38.49	20.02	42.07	128.81	0.49
CH7	1640	34.52	8.40	14.72	47.99	0.21
----- DATE=-85 -----						
CH4	1640	30.94	6.13	18.95	61.03	0.15
CH5	1640	37.66	8.94	18.97	65.75	0.22
CH6	1640	36.61	10.65	5.83	67.32	0.26
CH7	1640	13.32	4.27	5.24	28.94	0.11
----- DATE=-49 -----						
CH4	1640	21.01	4.39	12.58	36.60	0.11
CH5	1640	24.88	6.60	10.98	52.06	0.17
CH6	1640	23.75	7.79	8.63	50.85	0.19
CH7	1640	8.09	2.82	1.45	18.51	0.07

Finney County Area Data by Julian Date

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERR CR OF MEAN
----- DATE=8 -----						
CH4	1040	13.00	1.27	9.00	18.00	0.14
CH5	1040	15.79	2.26	11.00	22.00	0.07
CH6	1040	17.33	2.45	12.00	23.00	0.08
CH7	1040	9.36	1.11	6.00	12.00	0.03
----- DATE=63 -----						
CH4	1040	35.29	12.73	17.68	98.00	0.39
CH5	1040	41.43	14.50	23.53	119.37	0.45
CH6	1040	43.22	12.36	28.69	115.63	0.38
CH7	1040	16.35	3.37	9.98	34.63	0.10

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Finney County Area Data by Julian Date

variable	n	mean	standard deviation	minimum value	maximum value	std. dev.	error
----- DATE=98 -----							
CH4	1040	35.95	3.16	26.70	45.28	0.10	
CH5	1040	42.64	5.62	38.29	57.81	0.18	
CH6	1040	54.31	4.68	41.12	72.27	0.15	
CH7	1040	19.94	2.27	14.67	25.49	0.07	
----- DATE=105 -----							
CH4	1007	36.24	7.94	18.95	55.93	0.25	
CH5	1007	41.90	12.89	15.54	72.59	0.41	
CH6	1007	56.08	5.90	39.87	76.11	0.19	
CH7	1007	23.22	3.40	15.67	65.91	0.11	
----- DATE=143 -----							
CH4	1040	40.73	6.84	24.38	61.53	0.21	
CH5	1040	46.35	12.27	18.45	76.72	0.38	
CH6	1040	64.06	6.03	48.59	85.97	0.19	
CH7	1040	22.83	1.86	16.99	28.67	0.06	
----- DATE=152 -----							
CH4	1040	36.63	6.47	24.00	55.00	0.20	
CH5	1040	40.45	10.97	19.00	79.00	0.34	
CH6	1040	52.75	6.19	38.00	77.00	0.19	
CH7	1040	21.96	1.95	17.00	28.00	0.06	
----- DATE=162 -----							
CH4	1040	35.90	6.15	24.58	55.73	0.19	
CH5	1040	49.12	12.17	33.37	83.64	0.38	
CH6	1040	64.91	8.57	47.35	93.45	0.27	
CH7	1040	27.38	2.90	19.12	36.11	0.09	
----- DATE=170 -----							
CH4	1040	48.94	18.96	22.00	127.00	0.59	
CH5	1040	57.02	21.84	19.00	127.00	0.68	
CH6	1040	60.24	20.64	18.00	127.00	0.65	
CH7	1040	22.54	7.40	5.00	48.00	0.23	
----- DATE=186 -----							
CH4	1040	40.14	4.08	32.67	58.05	0.13	
CH5	1040	68.69	6.48	45.51	97.33	0.20	
CH6	1040	66.75	6.61	51.09	93.45	0.20	
CH7	1040	25.93	2.38	21.24	35.05	0.07	

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Finney County Area Data by Julian Date

variable	n	mean	standard deviation	minimum value	maximum value	std error of mean
----- DATE=207 -----						
CH4	1040	48.18	4.50	38.00	61.00	0.15
CH5	1040	50.23	7.44	36.00	81.00	0.23
CH6	1040	53.74	6.37	38.00	82.00	0.20
CH7	1040	21.35	2.10	15.00	30.00	0.07
----- DATE=204 -----						
CH4	1040	40.27	5.45	30.00	60.00	0.17
CH5	1040	49.35	8.72	29.00	80.00	0.27
CH6	1040	52.54	6.86	36.00	78.00	0.21
CH7	1040	20.69	2.03	14.00	29.00	0.07
----- DATE=225 -----						
CH4	1040	37.55	5.70	28.00	62.00	0.18
CH5	1040	46.76	8.67	26.00	82.00	0.27
CH6	1040	50.39	7.19	32.00	78.00	0.22
CH7	1040	19.99	2.56	13.00	29.00	0.08
----- DATE=-108 -----						
CH4	1040	27.64	2.99	19.00	37.00	0.09
CH5	1040	33.78	4.61	20.00	46.00	0.14
CH6	1040	38.57	4.82	23.00	50.00	0.15
CH7	1040	15.79	2.17	9.00	22.00	0.07
----- DATE=-99 -----						
CH4	1040	25.58	3.02	18.00	34.00	0.09
CH5	1040	31.95	4.54	18.00	43.00	0.14
CH6	1040	36.80	5.23	19.00	49.00	0.16
CH7	1040	15.13	2.33	9.00	21.00	0.07
----- DATE=-81 -----						
CH4	1040	24.49	3.92	14.00	38.00	0.12
CH5	1040	30.41	5.36	16.00	49.00	0.17
CH6	1040	35.20	5.91	19.00	53.00	0.18
CH7	1040	15.51	2.36	9.00	22.00	0.07
----- DATE=-45 -----						
CH4	1040	15.54	1.96	10.03	21.50	0.06
CH5	1040	17.97	3.22	9.64	28.09	0.10
CH6	1040	23.97	4.59	12.42	34.38	0.15
CH7	1040	9.97	2.56	5.24	16.62	0.08

APPENDIX B

CLUSTER TREES

The cluster trees included in this appendix are for the Yolo County and Keith County locations as described in appendix A. Separate trees were produced by date for the area pixels and the field pixels. Data were also combined by area or by field for the period spring greenup to harvest which indicate the correlation coefficients remain high over this time period. Although cluster trees are not attached for other data sets described in appendix A, the results were very similar.

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Keith County - March 27 thru August 14, 1978 - Area

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Keith County - October 12, 1977 - Area

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Keith County - November 17, 1977 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD VARIABLE NO.									
	NAME	NO.	VARIABLE	NO.	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED		
AVI	(1)	99/99/99/97 97 97 96 96 98 96 97 97 94 94/93 97/99/80 95/77/79 86/74 83 47 46 45 42/16 61 53/ 4 27 77/10/							
PVI7	(22)	99/98/96 97 96 95 98 97 98 90 96 93/93 97/44/40 94/80/76 84/69 78 40 39 37 36/23 68 55/ 6 28 76/ 8/							
ND7	(10)	99/97/97 97 97 97 90 96 97 98 95 94/97 98/93/09 93/78/79 88/73 82 46 45 44 42/17 62 31/ 6 29 73/10/							
TV17	(38)	97 97 97 96 97 96 96 97 94 93/94 93/43/87 93/77/79 86/74 83 48 47 45 44/15 60 53/ 5 25 76/11/							
CLAI	(6)	99 99/99/98 97 97 98/97 97 93/93/89 94/85/86 87/68 80 42 40 39 37/23 40 52/18 7 62/17/							
NDO	(17)	99/99/99 90 90 99/97 98/97 93/94/91 92/83/03 87/70 80 41 40 38 36/24 61 57/22 6 61/11/							
TV16	(34)	98/99 98 90 99/97 98/96 94/93/91 93/83/03 86/69 80 41 40 38 36/23 60 58/23 3 60/ 1/							
OLAI	(20)	97 96 96 98/96 96 96/98 96/97 89/84/03 91/68 80 42 41 39 38/22 59 47/17 7 62/18/							
GVI	(10)	99/99/97/97 97 90/96 73/74/94 73/83/79 83/70 78 39 38 36 33/27 64 62/23 10 64/ 4/							
QV61	(30)	99/99/97 98/96 94/93/93 93/86/77 89/68 78 33 34 32 28/31 66 63/28 7 61/ 0/							
MV1	(13)	99/98 90/96 93/93/93 93/87/73 73/66 74 33 31 30 26/33 70 63/25 11 63/ 9/							
QV60	(11)	97 98/97 96/93/93 93/83/79 83/70 78 39 38 36 33/27 64 61/22 11 64/ 4/							
GRADD	(9)	99/99 93/91/92 91/93/80 81/55 68 23 22 20 19/42 74 61/23 6 38/12/							
PVI6	(21)	95 92/91/94 91/93/79 79/58 69 25 24 23 20/41 71 64/33 6 34/ 6/							
R65	(23)	98/95/91 93/83/00 08/67 77 39 38 36 34/23 62 49/20 10 42/ 7/							
R75	(27)	95/93/89 93/77/76 83/69 78 42 41 39 38/20 63 45/ 6 25 73/ 9/							
LAI	(12)	98 92/76/74 83/71 78 43 41 40 37/19 59 49/14 18 67/ 4/							
R64	(24)	95/84/50 63/60 61 20 19 17 10/44 72 76/42 3 31/23/							
R74	(26)	76/61 71/68 70 32 31 30 26/29 71 65/15 30 73/14/							
GVVI	(33)	71 66/29 42 7 8 9 11/67 80 62/43 16 30/12/							
MVVI	(13)	92/37 80 02 31 31 34/ 0 28 19/ 4 11 43/60/							
R45	(20)	66 85 58 57 56 59/ 4 35 10/ 9 13 63/80/							
CH4	(2)	93/80 87 86 00/43 0 31/ 0 21 64/ 6/							
CH5	(3)	87/87 86 85 83/36 8 23/ 8 17 67/23/							
MNSI	(15)	99/99/98/77 37 8/28 21 31/24/							
SBDI	(32)	99/98/78 39 9/29 21 31/24/							
SDI	(29)	98/79 40 11/30 20 30/23/	NAME	NO.	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED		
			SDI	1	35	35	99 93		
			PVI7	22	1	1	99 97		
			ND7	18	1	1	99 39		
			TV17	33	1	1	99 18		
			CLAI	6	21	10	97 .82		
			NDO	17	34	10	97 .70		
			TV16	24	6	6	97 .62		
			OLAI	20	6	6	97 .61		
			GVI	10	11	11	99 .48		
			QV61	30	10	10	99 .04		
			MV1	13	10	10	99 .76		
			QV60	13	10	10	98 .95		
			GRADD	11	6	6	97 .43		
			PVI6	7	21	14	97 .83		
			R65	25	27	14	98 .99		
			R75	27	1	1	98 .06		
			LAI	12	1	1	94 .07		
			R54	24	26	26	93 .57		
			RV4	24	1	1	92 .56		
			SVVI	25	23	23	92 .56		
			MVVI	26	23	23	92 .56		
			R45	25	21	21	80 .05		
			CH4	24	21	21	85 .78		
			CH5	24	18	18	93 .77		
			MNSI	14	26	26	48 .53		
			SSDI	29	15	15	47 .97		
			SDI	29	15	15	99 .96		
			SNSI	31	1	1	47 .95		
			CH6	4	8	8	98 .06		
			CH7	3	4	4	81 .67		
			ELAI	0	1	1	45 .50		
			MNSI	14	28	28	64 .26		
			NSI	19	28	28	79 .92		
			R76	28	1	1	92 .80		
			YVI	36	1	1	17 .83		

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Keith County - December 4, 1977 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD NAME NO		VARIABLE NO	OTHP-3 BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI	PV17				
(1) 99/90 96/92/93/74 86 84 82 87 88 85 93 90 93 91 66/69/41 72/30 30 45 7 8 10 9 73/37 46 6/ 2 26 49/					
(22) 97 96/92/91/74 86 84 82 87 90 87 93 91 94 91 70/69/46 75/22 41 53 17 18 20 18 79/36 40 7/ 3 27 41/					
(10) 99/94/93/74 86 84 84 87 85 82 90 88 90 91 62/69/39 70/31 51 41 4 5 6 70/37 47 7/ 0 28 47/					
(27) 90/80/74 86 84 83 89 84 82 90 87 89 90 62/72/37 70/32 52 40 3 4 5 5 68/37 50 7/ 2 26 46/					
(33) 93/81 80 79 78 78 77 76 03 80 84 83 89/61/39 64/23 43 41 8 9 10 8 67/33 43 3/ 4 31 49/					
(26) 61 78 74 71 77 75 76 85 85 89 86 54/66/67 84/33 25 53 21 22 24 31 80/ 0 6 43/14 33 42/					
(6) 98 97 97/93/90 93 88 88 86 91 88/65/32 78/ 7 33 64 57 28 29 32 58/61 48 6/48 33 21/					
(17) 99/98/90/94 97 95 95 94 98/86/72/56 85/19 30 64 24 25 27 31 67/54 46 3/41 19 3/					
(34) 99/96/94 96 94 94 93 97/86/71/57 84/14 30 65 23 26 28 31 66/54 45 3/42 20 3/					
(20) 96/91 93 92 91 90 96/84/71/55 81/13 36 63 24 25 26 30 64/53 47 3/40 20 3/					
(25) 94 96 96 95 94 96/84/76/51 84/18 40 62 22 23 24 28 66/53 47 3/39 16 0/					
(GRAB5	(9) 98/94 93 94 94/93/70/52 81/ 3 25 75 40 41 42 40 79/58 44 9/28 10 2/				
(PV16	(21) 97 97 96 95/92/71/59 87/ 7 29 73 35 36 37 41 73/53 38 3/44 21 5/				
(GV1	(10) 99/99/97/80/72/57 87/28 44 60 18 19 21 26 79/43 38 19/36 3 12/				
(SSVI	(30) 99/97/80/72/63 90/20 40 63 81 22 24 31 79/30 32 21/44 10 7/				
(MOVI	(13) 97/80/73/63 90/25 36 65 23 26 27 34 76/36 30 20/36 1 13/				
(GVSB	(11) 62/74/63 89/20 35 65 26 27 29 34 74/40 33 13/36 4 9/				
(SYVI	(33) 62/52 76/29 1 86 59 60 61 58 74/64 35 20/42 34 26/				
(LAI	(12) 44 68/13 24 51 21 22 23 27 57/29 20 11/26 2 6/				
(ELAI	(8) 85/ 6 23 72 34 34 57 73 65/23 45 62/60 10 20/				
(R64	(24) 14 5 79 46 46 49 62 77/10 4 44/39 14 10/				
(CH4	(2) 77/47 76 76 74 55 27/23 9 56/17 12 33/				
(CH5	(3) 42 78 77 76 72 23/40 67 3/ 2 1 33/				
(CH6	(4) 88 89 89 90/83/22 11 6/43 21 30/				
(MSDI	(15) 99/99/94/70/ 1 34 2/22 11 34/				
(SSOI	(32) 99/94/71/ 3 32 3/22 11 35/				
		VARIABLE NO	OTHP-3 BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
(SDI	(29) 95/72/ 1 34 0/27 11 34/	AVI	1	28	20 30
		PV17	22	25	99 44
		ND7	18	27	99 04
		R64	27	1	97 19
		TV17	33	1	98 30
		R74	26	1	88 33
		CLAI	5	1	89 36
		ND6	17	33	99 88
		TV16	34	17	99 59
		DAI	34	5	97 47
		R65	39	5	97 06
		GRAB5	29	11	95 38
		PV16	21	9	98 22
		GV1	10	11	97 63
		SSVI	10	10	99 62
		GVSB	10	6	93 67
		SYVI	10	1	93 88
		LAI	1	1	82 27
		ELAI	1	24	70 18
		R64	24	1	83 64
		CH4	24	1	66 47
		CH3	24	1	66 57
		CH6	24	1	73 41
		MSDI	31	1	93 10
		SSOI	31	1	99 99
		SDI	31	1	99 95
		SSVI	31	1	97 26
		CH7	35	1	97 26
		HYVI	36	1	72 71
		R45	36	16	89 23
		YVI	36	16	89 23
		MNSI	36	1	99 35
		NSI	36	1	99 22
		R76	38	1	23 30

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Keith County - March 22, 1978 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

NAME	VARIABLE NO	AVI	N07	R73	PV17	TV17	CLAI	NDA	TV16	R65	DLAI	PV16	QVI	SOVI	H0VI	QVBS	ELAI	R64	R74	CH4	CH5	CH6	MNSI	SNSI	CH7	
AVI	(1)	98 97 98 98/00 03 04 05 04 71 91 87 90 89/50 37 80/64 76 60 60 39 39 38 10/57 2 11 35 30/13 22 64/ 07																								
N07	(18)	99/98 99/00 03 05 06 05 03 73 90 86 89 91/53 62 03/36 67 51 50 50 39 46 1/62 4 11 32 28/10 25 65/ 0	18	27	32	33	35	36	37	31	31	30	30	39	46	1/62	4	11	32	28/10	25	65/ 0				
R73	(27)	98/87 89 85 05 06 04 72 89 85 89 91/53 63 04/57 68 51 51 50 50 39 46 0/61 3 10 32 29/11 24 65/ 1	27	87	89	85	05	06	04	72	89	85	89	91	53	63	04/57	68	51	51	50	50	39	46	0/61	
PV17	(22)	99/88 84 84 05 04 75 89 85 09 89/52 60 81/51 63 45 44 44 23 43 8/66 10 14 33 23/ 7 26 65/ 9	22	88	84	84	05	04	75	89	85	09	89/52	60	81/51	63	45	44	44	23	43	8/66	10	14	33	23/ 7 26 65/ 9
TV17	(33)	98 89 05 05 04 74 90 85 89 90/52 61 02/54 66 49 49 48 27 47 3/63 4 12 33 23/ 9 23 65/ 9	33	98	89	05	05	04	74	90	85	89	90/52	61	02/54	66	49	49	48	27	47	3/63	4	12	33	23/ 9 23 65/ 9
CLAI	(6)	98 98 97 98/93/93 89 90 93/48 60 61/41 61 38 37 37 11 36 0/82 35 41 51 7/29 18 26/20	6	98	98	97	98/93/93	89	90	93/48	60	61/41	61	38	37	37	11	36	0/82	35	41	51	7/29	18	26/20	
NDA	(17)	99/99/99/99/95 93 93 94 97/61 72 66/47 61 38 38 37 10 32 2/70 33 31 38 19/44 27 19/14	17	99/99/99/99/95	93	93	94	97/61	72	66/47	61	38	38	37	10	32	2/70	33	31	38	19/44	27	19/14			
TV16	(34)	99/99/93/93 93 93 96/61 71 63/46 60 38 37 37 9 31 1/79 33 31 38 19/43 20 17/13	34	99/99/93/93	93	93	96/61	71	63/46	60	38	37	37	9	31	1/79	33	31	38	19/43	20	17/13				
R65	(23)	99/93/93 93 93 97/61 72 67/40 61 39 39 38 11 33 2/77 31 29 37 20/44 23 20/10	23	99/93/93	93	93	97/61	72	67/40	61	39	39	38	11	33	2/77	31	29	37	20/44	23	20/10				
DLAI	(20)	94/94 92 92 93/36 67 62/44 60 37 37 37 9 32 2/60 35 36 43 14/51 20 17/17	20	94/94	92	92	93/36	67	62/44	60	37	37	37	9	32	2/60	35	36	43	14/51	20	17/17				
PV16	(21)	96 85 87 90/59 68 34/22 36 11 10 10 18 4 21/90 37 40 35 5/44 38 2/22	21	96	85	87	90/59	68	34/22	36	11	10	10	18	4	21/90	37	40	35	5/44	38	2/22				
QVI	(10)	99/99/98/71 79 79/66 72 53 54 54 27 44 13/63 9 8 22 42/49 11 33/ 9	10	99/99/98/71	79	79/66	72	53	54	54	27	44	13/63	9	8	22	42/49	11	33/ 9							
SOVI	(30)	99/97/70 05 01/68 70 53 53 52 23 40 13/59 7 0 12 50/50 15 28/ 7	30	99/97/70	05	01/68	70	53	53	52	23	40	13/59	7	0	12	50/50	15	28/ 7							
H0VI	(13)	98/70 05 04/62 63 47 44 45 18 33 2/64 12 0 12 46/50 7 35/ 7	13	98/70	05	04/62	63	47	44	45	18	33	2/64	12	0	12	46/50	7	35/ 7							
QVBS	(11)	74 82 01/56 62 42 42 41 13 32 0/70 20 10 20 37/47 11 32/ 6	11	74	82	01/56	62	42	42	41	13	32	0/70	20	10	20	37/47	11	32/ 6							
ELAI	(8)	97/82/52 29 21 21 20 2 3 0/30 0 46 48 75/75 12 11/ 9	8	97/82/52	29	21	21	20	2	3	0/30	0	46	48	75/75	12	11	9								
R64	(24)	83/54 39 20 20 27 2 3 4/38 2 36 36 71/74 15 14/10	24	83/54	39	20	20	27	2	3	4/38	2	36	36	71/74	15	14/10									
R74	(26)	63 32 44 44 42 24 29 3/32 18 40 23 68/34 33 63/14	26	63	32	44	44	42	24	29	3/32	18	40	23	68/34	33	63/14									
CH4	(2)	90 93 93 93 93 82 80/70/14 66 42 10 70/47 11 39/12	2	90	93	93	93	93	82	80/70/14	66	42	10	70/47	11	39/12										
CH5	(3)	96 96 96 96/84 93/71 0 46 1 31 43/20 0 41/ 2	3	96	96	96	96/84	93/71	0	46	1	31	43/20	0	41	2										
CH6	(1)	96 96/84/83 19 68 19 17 53/23 14 40/ 6	1	96	96/84/83	19	68	19	17	53/23	14	40/ 6														
MNSI	(31)	80/15 61 0 38 29 0 21 46/ 0	31	80/15	61	0	38	29	0	21	46/ 0															
CH7	(9)	49 69 15 10 37/29 16 6/ 6	9	49	69	15	10	37/29	16	6/ 6																

GRABS	NAME	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI	AVI	1	1	35	12 .88
N07	N07	18	18	4	98 .70
R73	R73	27	27	4	98 .89
PV17	PV17	32	32	4	98 .89
TV17	TV17	33	33	4	98 .24
CLAI	CLAI	35	35	1	99 .01
NDA	NDA	36	36	1	99 .34
TV16	TV16	34	34	17	99 .27
R65	R65	34	34	17	98 .17
DLAI	DLAI	20	20	6	94 .30
PV16	PV16	20	20	6	98 .10
QVBS	QVBS	30	30	10	99 .32
SOVI	SOVI	30	30	10	99 .11
ELAI	ELAI	11	11	1	97 .93
CH4	CH4	24	24	1	97 .89
CH5	CH5	24	24	1	98 .20
MNSI	MNSI	45	45	4	98 .00
NSI	NSI	19	19	6	88 .39
R76	R76	11	11	6	100 .00
LA1	LA1	12	12	6	95 .27
GRABS	GRABS	33	33	6	95 .14
SYVI	SYVI	33	33	6	95 .27
YVI	YVI	36	36	6	95 .10
SNSI	SNSI	31	31	3	95 .07
CH7	CH7	31	31	3	95 .07
GRABS	GRABS	33	33	6	95 .07
SYVI	SYVI	33	33	6	95 .07
YVI	YVI	36	36	6	95 .07
MNSI	MNSI	14	14	3	95 .19
NSI	NSI	19	19	3	98 .13
R76	R76	20	20	6	95 .41
LA1	LA1	12	12	6	98 .68

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Keith County - March 31, 1978 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

NAME NO

AVI	(1) 90 98 99 98/95 91 91 92 92 94 92 91 90 84 82/88/59 71/73/45 58/57 62 7/60 69 8 31 30 29 26 3 22 72/
ND7	(18) 99/99/99/95 93 93 93 95 95 94 92 88 86/91/64 76/76/55 59/53 57 10/31 60 18 20 20 18 15 9 19 72/
R75	(27) 99/98/94 92 92 93 92 94 94 93 91 87 89/91/63 75/77/54 58/53 57 10/31 59 18 21 20 18 15 8 20 72/
PV17	(22) 99/94 92 92 93 92 95 94 94 92 88 86/92/65 76/76/56 59/53 56 10/30 59 19 19 18 17 14 9 20 72/
TV17	(35) 94 92 92 92 94 94 93 92 88 86/90/64 75/72/59 59/54 57 10/31 59 19 20 19 18 15 9 19 72/
CLAI	(6) 98 98 98 99/97 96 94 95/92 92/91/63 79/69/47 68/71 67 1/48 62 21 20 19 18 14 23 5 47/
ND6	(17) 99/99/99/98 98 97 98/94 96/94/73 84/70/53 75/64 56 9/44 53 32 10 9 8 3 37 19 42/
TV16	(34) 97/99/90 98 97 98/93 96/91/73 84/69/53 73/64 56 7/43 53 32 10 9 8 2 30 16 41/
R65	(23) 99/98 98 97 97/94 95/93/71 84/73/52 73/63 57 10/45 54 30 12 11 9 4 36 13 44/
DLAI	(20) 97 97 95 95/93 94/91/66 79/69/49 72/69 63 2/44 57 27 14 13 12 8 32 13 42/
GV1	(10) 99/99 99/94 96/90/78 88/73/58 73/55 48 19/46 52 33 9 8 7 0 37 8 49/
GVSB	(11) 99 99/95 96/91/79 89/74/60 74/53 47 20/43 49 36 5 4 3 2 38 9 49/
MGVI	(13) 99/93 97/93/03 91/73/65 76/48 40 23/39 43 41 0 0 2 6 41 9 49/
SVVI	(30) 95 97/90/82 91/73/61 76/50 41 23/42 46 39 2 1 0 6 43 14 44/
GRAB	(9) 98/83/76 85/66/74 89/60 44 5/16 29 55 16 17 18 21 42 20 39/
PV16	(21) 84/82 90/66/70 88/56 39 15/21 30 55 15 16 17 22 52 20 32/
R74	(26) 83 89/76/71 60/21 21 44/40 35 38 2 2 4 11 27 18 68/
ELAI	(8) 96/57/73 72/4 14 63/17 3 64 31 32 34 45 70 26 22/
R64	(24) 67/73 77/19 4 54/24 15 61 24 24 26 37 67 25 28/
LAI	(12) 47 44/26 30 27/41 39 20 10 10 8 3 17 14 54/
CH7	(5) 81/4 13 28/33 32 86 68 69 70 41 7 39/
SYVI	(33) 49 19 2/24 10 82 53 54 55 57 63 50 4/
HYVI	(16) 90/66/21 56 3 28 27 28 33 3 22 12/
R45	(23) 64/45 77 35 58 57 57 63 33 11 36/
YVI	(36) 23 15 26 17 17 19 34 31 0 7/

CH4	(2) 91/61 86 86 85 76/16 34 45/	NAME NO	VARIABLE	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
CH3	(3) 81 89 88 88 85/29 30 47/	AVI	1	28	34	30 07
		ND7	18	35		98 92
		R75	27	18		99 81
		PV17	28	18		99 29
		CLAI	29	21		99 77
		ND6	17	20		99 35
		TV16	34	17		99 95
		R65	25	17		99 35
		DLAI	26	20		98 72
		GV1	10	20		99 61
		GVSB	11	10		99 60
		MGVI	13	30		99 70
		SVVI	30	26		97 39
		GRAB	9	21		98 87
		PV16	21	21		92 18
		R74	25	24		98 65
		ELAI	26	24		77 60
		R64	24	24		71 60
		LAI	12	11		81 42
		CH7	13	33		81 26
		SYVI	8	35		83 00
		HYVI	23	10		80 18
		R45	23	10		76 83
		YVI	20	10		41 26
		CH4	25	28		91 67
		CH5	25	22		94 56
		CH6	26	21		98 56
		MSBI	15	15		99 97
		SSBI	29	15		80 93
		SBI	29	15		85 00
		SNSI	31	26		85 49
		MNSI	14	26		82 07
		NSI	19	14		
R76	(28)					

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Keith County - April 28, 1978 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DIJSTANCE METHOD

VARIABLE NO

NAME

NO

AVI

PVI7

ND7

TVI7

CLAI

ND6

TVI6

GV1

BGVI

MGVI

QVBD

CRAOB

PVI6

DLAI

R65

R75

R64

R74

LAI

CH6

CH7

SYVI

HYVI

R45

CH4

CH5

ELAI

MNSI

NSI

R76

YVI

MSOI

SSOI

SDI

SNSI

	NAME	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
ELAI	AVI	1	ND7	10	.95 .43
	PVI7	22			.99 .89
	ND7	18			.99 .63
MNSI	CLAI	33		10	.99 .27
	ND6	19			.98 .63
NSI	TVI7	34		10	.99 .50
	GV1	30			.99 .78
	SCVI	30			.99 .71
	MGVI	31			.99 .96
	QVBD	31			.99 .43
	CRAOB	11			.99 .43
	PVI6	9			.99 .43
	DLAI	21			.99 .14
	R65	20			.98 .37
	R75	24			.99 .24
	R64	24			.98 .75
	R74	26			.99 .50
	LAI	26			.99 .74
	CH6	24			.99 .76
	CH7	24			.99 .83
	SYVI	25			.99 .27
	HYVI	25			.99 .63
	R45	26			.99 .63
	CH4	26			.99 .63
	CH5	26			.99 .63
	ELAI	27			.99 .63
	MNSI	27			.99 .63
	NSI	28			.99 .81
	R76	28			.99 .35
	YVI	28			.99 .35
	MSOI	29			.99 .50
	SSOI	30			.99 .50
	SDI	31			.99 .43
	SNSI	31			.99 .43

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Keith County - May 15, 1978 - Area

**TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD
VARIABLE**

NAME **NO.**

AVI	(1) 99/99/99/99/99 98 98 90 99 98 99 99 97 97/97 97/95 97/96/91 95/00/07/00/76 91/73 72 71 60/76 56 50/44/32/
PV17	(22) 99/99/99 98 90 90 99 90 99 99 98 97/97 97/95 97/96/89 94/09/09/80/76 90/71 70 60 50/77 56 49/47/33/
TV17	(33) 99/99 90 90 90 99 90 99 99 97 97/96 97/95 96/95/41 95/00/06/00/77 91/74 72 71 61/76 55 50/44/31/
ND7	(10) 99 90 90 98 90 90 90 99 97 97/98 99/96 90/96/90 94/00/07/00/75 92/72 71 69 59/75 56 50/45/32/
CLAI	(6) 99 99/99/99/99 99 99 99/99 99/90 97/95 99/95/89 94/92/06/03/81 93/71 70 68 50/75 51 55/49/22/
ND6	(17) 99/99/99 99 99 99/98 99/98 97/96 96/95/83 94/92/06/01/80 92/70 69 67 56/77 54 59/50/19/
TV16	(34) 97/97 99 99 99/97 97/98 96/96 95/95/87 94/92/03/00/81 93/71 69 68 55/77 54 60/50/18/
OLAI	(20) 99 90 90 99/98 90/90 97/95 95/95/80 94/92/03/01/82 94/71 69 68 57/72 50 57/49/19/
AVI	(10) 99/99/99/99/98 99/98 96/47 96/95/70 94/91/86/82/70 90/71 70 68 56/80 57 60/50/21/
SOVI	(30) 99/99/99/68 99/67 46/97 98/75/90 94/91/86/01/77 89/70 67 67 54/81 59 62/51/19/
M0VI	(13) 99/98 99/90 97/97 97/96/90 99/91/88/03/76 89/69 68 66 59/81 59 60/51/22/
OVBD	(11) 98 99/98 97/97 97/96/70 94/91/82/83/77 79/70 69 67 59/79 58 59/50/23/
GRAB5	(9) 99/97 95/95 94/94/83 90/96/90/75/83 91/62 61 59 48/76 48 50/59/17/
PV16	(21) 97 95/96 94/94/86 91/93/87/77/01 90/65 63 61 49/79 52 60/57/13/
R65	(29) 99/97 96/95/80 92/90/86/81/77 42/69 68 66 54/73 55 57/49/22/
R75	(27) 95 90/95/88 92/86/87/87/72 51/70 69 67 57/71 57 47/45/35/
R64	(24) 90/94/88 80/80/07/70/66 81/64 62 60 44/67 69 66/55/20/
R74	(26) 95/90 90/83/89/89/63 83/68 67 65 52/81 60 51/47/30/
LAI	(12) /06 09/06/07/01/71 87/66 65 63 51/74 57 51/49/50/
CH4	(2) 96/67/64/81/58 79/90 90 88 76/73 73 54/13/30/
CHO	(3) 77/68/82/76 91/89 89 87 79/67 54 50/19/22/
BYVI	(33) 87/62/86 89/42 41 39 28/72 33 64/77/3/
CH7	(5) 80/80/61 73/33 32 29 19/76 48 40/73/37/
R76	(28) 50 76/70 69 68 64/60 54 10/21/72/

R45	(20) / 72 71 70 67 47 29 30/34/19/	VARIABLE	OTHER OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
M5B1	(15) 99/99/95/44 50 30/24/30/	NAME NO.	1	19	.96 .99
		TV17	22		.99 .93
		ND7	18		.99 .77
		CLAI	6		.99 .37
S5B1	(29) / 96/40 48 27/28/30/	M5B2	17	34	.99 .03
		TV16	6		.99 .03
		OLAI	6		.99 .03
		GVI	6		.99 .03
SNS1	(31) / 18 25 4/4/37/	SVI	10		.99 .66
		NGVI	10		.99 .75
		GSVI	10		.99 .75
		GRAB9	10		.99 .43
ELAI	(8) 82/74/58/11/	PV16	21		.99 .43
		R63	21		.99 .43
		R73	21		.99 .43
		R64	21		.99 .43
VVI	(36) / 56/10/29/	R74	21		.99 .43
		LAI	21		.99 .43
MNS1	(14) / 53/52/	CH4	21		.99 .43
CH6	(4) / 17/	CH5	21		.99 .43
		SVI	21		.99 .43
		CH7	21		.99 .43
		R76	21		.99 .43
NS1	(19) /	HYV1	23		.99 .44
		R45	23		.99 .44
		M5B1	23		.99 .44
		SSB1	23		.99 .44
		SD1	23		.99 .44
		SNS1	23		.99 .44
		ELAI	23		.99 .44
		VVI	23		.99 .44
		MNS1	14		.99 .44
		CH6	14		.99 .44
		NS1	14		.99 .44

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Keith County - May 16, 1978 - Area

THIS PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERED BY AVERAGE DISTANCE METHOD

NAME NO

AVI	1 11 99/99/99/99 90 90 90 99 99 99 98 98/93 97 96 97/99/92/93/92 96/88/70 91/60/73 97 98/71 70 67 80/81/
PV17	1 22/99/99/99 90 90 90 99 99 99 98 90/93 97 96 97/99/92/94/91 93/99/77 91/70/76 59 56/69 68 65 49/52/
ND7	1 18/99/99 99 98 90 99 99 99 98 98/96 97 98 98/96/92/93/92 93/89/77 92/69/74 60 57/71 69 66 49/51/
TV17	1 33/99 90 98 98 99 90 99 99 98 98/94 93 95 95/99/92/92/92 96/88/74 91/60/75 58 56/72 70 67 81/80/
CLAI	1 6/99 99/99/99 99 99 99/99 99/95 95 97 96/94/93/91/90 96/83/82 93/71/74 55 61/69 68 65 48/51/
ND6	1 17/99/99/99 99 99 99/99 99/96 96 97 96/93/91/91 93/82/81 92/72/77 58 63/69 67 65 48/49/
TV16	1 34/99/99 99 99 99/99 99/95 95 97 95/94/93/90/91 93/81/82 92/72/77 57 63/69 67 65 48/49/
DLAI	1 20/99 90 98 99/98 90/94 94 97 96/94/93/90/90 93/81/83 91/71/72 54 62/69 68 65 48/49/
GV1	1 10/99/99/99/99 99/96 96 97 96/95/94/92/92 95/83/78 90/72/79 61 65/69 68 65 49/51/
GVVI	1 30/99/99/99 99/97 96 97 96/93/91/92/92 93/82/77 89/73/80 63 65/68 66 65 49/52/
HVVI	1 15/99/99 99/97 97 96 96/95/94/92/92 93/83/77 89/73/80 63 65/68 66 65 49/52/
GV88	1 11/99 99/97 97 98 97/95/94/92/92 93/83/78 90/72/79 62 64/69 67 64 44/42/
GRABD	1 9/99/93 94 96 95/94/97/93/97 93/81/83 92/77/76 53 60/63 61 58 40/18/
PV16	1 21/96 93 76 93/94/97/92/89 93/79/81 90/77/79 57 60/64 63 60 40/13/
R64	1 24/98/97 96/93/90/91/91 89/78/66 82/73/83 73 71/62 61 57 32/20/
R74	1 26/97 98/95/87/93/91 90/87/63 84/70/80 71 59/66 64 61 40/35/
R65	1 25/99/93/92/90/89 92/81/73 91/71/72 61 63/66 65 62 42/22/
R75	1 27/95/89/92/90 92/86/72 91/68/70 61 53/67 66 63 43/33/
LAI	1 12/80/90/89 90/89/69 87/68/72 62 56/66 64 61 43/32/
SVVI	1 33/91/78 83/69/87 88/83/74 43 68/48 46 44 26/ 3/
CH7	1 31/76 79/85/66 80/84/77 56 49/43 41 37 20/30/
CH4	1 21 95/81/60 80/46/77 73 62/67 86 84 62/27/
CH5	1 31/83/79 92/80/67 56 56/86 83 83 68/24/
R76	1 28/93 78/49/58 53 17/60 67 65 5/71/
HYVI	1 16/90/58/38 2 44/34 52 51 48/ 8/
R45	1 23/57/47 30 43/71 67 60 60/21/

	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
CH6	1 41/73 41 63/ 1 0 4 23/ 6	NAME NO	19	23 39
		AVI	1	99 95
		PV17	22	99 70
		ND7	18	97
		TV17	35	99 35
		CLAI	36	99 92
		ND6	34	99 82
		TV16	34	99 60
		DLAI	20	99 83
		GV1	20	99 95
		GVVI	10	99 73
		GV88	10	99 43
		GRABD	9	99 73
		PV16	21	98 89
		R64	27	97 95
		R74	24	98 50
		R63	26	99 50
		R75	27	96 33
		LAI	22	95 65
		SVVI	22	95 42
		CH7	20	95 15
		CH4	20	91 43
		CH5	20	90 34
		R76	20	90 42
		HYVI	20	93 35
		R45	20	72 00
		CH6	24	83 62
		ELAI	8	82 79
		YV1	6	92 95
		MNS1	14	93 47
		MSB1	14	93 00
		SSB1	15	93 39
		SNI	15	93 00
		NS1	19	93 39

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Keith County - May 25, 1978 - Area

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OF POOR QUALITY**

Keith County - June 11, 1978 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

VARIABLE NO

AVI	(1) 99/98 96 96/99 98 90 97 97 96 98 98 95 93/89 93/89 90/85 90/86/01 86 73 72 72 73 49/67 5 31 42/30/
PV17	(22) 90 97 97/90 97 96 95 95 94 96 96 94 94/40 95/42 93/02 87/04/74 80 64 64 63 64 39/70/ 0 43/30 43/27/
QVI	(10) 99/99/90 90 90 97 97 95 95 96 95 93/93 93/93 96/03 86/76/77 02 66 65 65 65 39/39/ 0 47/14 26/23/
DGVI	(30) 99/97 97 97 96 96 94 94 94 94 92/94 92/94 92/83 84/72/74 79 62 62 61 61 34/70/ 3 32/ 8 22/21/
MQVI	(13) 97 96 96 95 95 93 93 93 93 91/94 93/96 97/80 82/73/70 75 57 57 56 56 29/77/10 56/10 28/20/
CLAI	(6) 99/99 99 99/99/90/90 98/97 95/40 94/91 93/88 92/81/79 03 70 70 70 70 43/67/ 3 43/26 34/33/
LAI	(12) 99 99 99/98/90 90/97 96/90 94/89 91/88 92/81/82 87 74 73 73 73 49/68/10 38/24 32/31/
QVBD	(11) 99 99/99 90/97 97/92 95/87 90/86 92/82/03 88 73 74 74 74 01/69/12 36/23 32/27/
ND6	(17) 99/99/90 90/97 96/90 93/87 90/89 93/79/83 89 73 75 75 75 52/66/14 37/21 27/31/
TV16	(34) 99/90 90/96 95/89 92/87 90/89 92/79/84 89 76 76 75 75 52/67/13 36/21 26/32/
OLAI	(20) 97/90 97/90 97/87 91/83 88/90 96/00/82 88 76 75 75 76 59/50/16 35/26 29/36/
ND7	(10) 99/97 98/90 95/84 06/05 94/00/04 09 77 77 76 77 53/62/14 29/34 41/30/
TV17	(35) 94 95/96 93/93 06/07 93/00/06 91 77 79 79 77 58/65/17 28/35 41/32/
R65	(29) 98/92 95/07 09/03 92/77/78 83 69 68 68 68 60 43/59/ 6 39/21 30/27/
R75	(27) 90 96/04 03/00 92/03/79 83 70 70 70 70 40/50/ 7 33/32 43/26/
R64	(24) 95/07 91/66 73/66/69 70 54 53 53 50 26/00/ 9 47/ 2 24/ 3/
R74	(26) 04 06/70 82/05/77 79 66 65 65 64 42/71/ 1 34/26 48/ 7/
GRABD	(9) 90/78 76/61/50 59 38 37 37 30 7/70/50 73/ 3 30/30/
PV16	(21) 80 77/60/50 65 45 44 44 44 13/73/20 70/ 1 13/23/
MYVI	(16) 92/64/74 05 74 74 74 76 55/47/20 34/24 7/64/
R45	(23) 80/80 80 79 78 70 00 61/38/26 24/40 30/35/
R76	(20) 78 80 75 74 74 77 63/43/17 0/69 76/23/
CH4	(2) 97/97 97 97 95/07/56/59 16/31 29/17/
CH5	(3) 96 96 96 96/04/53/54 4/36 28/34/
MBSI	(15) 99/99/99/94/40/72 28/41 28/30/
BBI	(32) 99/99/95/40/72 29/41 28/30/

BBI	(29) 99/99/95/39/72 29/41 27/30/	NAME NO	VARIABLE	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI	1	AVI	1	36	36	28/25
PV17	22	QVI	10	10	10	99/31
QVI	10	DGVI	10	10	10	99/70
DGVI	10	MQVI	13	13	13	97/32
MQVI	13	CLAI	6	27	27	96/00
CLAI	6	LAI	12	6	6	79/39
LAI	12	QVBD	11	34	34	79/30
QVBD	11	ND6	17	34	34	99/91
ND6	17	TV16	34	6	6	99/33
TV16	34	OLAI	20	6	6	90/88
OLAI	20	ND7	18	35	35	99/37
ND7	18	TV17	35	6	6	99/39
TV17	35	R65	23	27	27	99/17
R65	23	R75	23	1	1	99/42
R75	23	R64	24	20	20	99/47
R64	24	R74	24	20	20	99/00
R74	24	GRABD	9	21	21	99/00
GRABD	9	PV16	21	21	21	99/00
PV16	21	MYVI	16	23	23	99/00
MYVI	16	R45	20	1	1	99/70
R45	20	R76	20	1	1	77/92
R76	20	CH4	14	4	4	91/96
CH4	14	CH5	14	4	4	91/96
CH5	14	MBSI	15	15	15	99/99
MBSI	15	BBI	15	15	15	100/00
BBI	15	ENBI	14	14	14	99/99
ENBI	14	CH6	14	14	14	96/09
CH6	14	ELAI	11	11	11	59/97
ELAI	11	QVI	10	10	10	59/97
QVI	10	DGVI	10	10	10	59/97
DGVI	10	MBSI	14	14	14	91/96
MBSI	14	NSI	14	19	19	29/16
NSI	14	YVI	36	1	1	29/16

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Keith County - June 21, 1978 - Area

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Keith County - June 29, 1978 - Area

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Keith County - July 27, 1978 - Area

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Keith County - August 13, 1978 - Area

Keith County - August 14, 1978 - Area

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Keith County - March 22 thru July 27, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

VARIABLE NO

AVI	(1) 99/96 95 98 97 98/98 97 96 96 97 90 97 93 91 92/98 91/94 81/83/40 79 41/70 38 36 34 34/ 1 39 83/68 2/
PV17	(22) 96 96 98 97 98/97 96 95 95 96 97 96 92 90 91/90 91/91 79/84/43 02 43/67 32 30 28 28/ 2 40 82/66 0/
GRADS	(9) 99/97 97 97/96 92 92 93 90 92 93 90 86 84/82 81/74 70/93/90 83 41/53 19 17 16 17/14 20 67/76 12/
PV16	(21) 98 98 98/96 94 94 94 91 93 94 91 88 83/86 83/76 77/74/57 01 46/58 22 20 10 17/23 15 63/73 5/
GV1	(10) 99/99/98 97 97 97 95 96 97 93 92 90/90 90/92 79/80/40 79 47/69 32 31 28 26/17 23 79/68 1/
SGVI	(30) 99/97 97 96 96 94 95 96 92 91 89/92 90/80 76/80/31 79 51/69 30 28 26 22/22 24 72/65 3/
MGVI	(13) 97 96 95 95 94 95 96 92 90 89/91 91/78 75/88/52 82 51/67 28 26 23 20/19 28 74/64 6/
CLAI	(6) 98 99 99/98 98/90/97/94 93/67 08/60 88/64/37 72 39/71 43 41 39 39/ 8 27 76/70 8/
GVBD	(11) 99 99/99 98/98/97/96 95/92 93/98 04/78/33 69 42/79 47 45 43 39/14 29 78/63 3/
ND4	(17) 99/98 98/98 98/96 93/89 89/90 88/80/31 69 39/77 49 48 46 42/14 32 74/71 2/
TV16	(34) 98 98 98/98/98/93 93/88 88/90 87/91/32 69 37/76 48 47 45 42/15 21 73/72 3/
ND7	(18) 99/98/97/97 17/90 93/90 07/74/26 67 34/79 51 30 40 43/ 2 38 84/63 1/
TV17	(33) 97/96/95 98/88 91/89 83/77/30 69 38/77 49 47 45 43/ 3 35 82/60 1/
LAI	(12) 96/95 94/88 90/88 86/80/33 69 36/75 46 44 42 40/ 8 29 77/70 2/
DLAI	(20) 97 93/84 83/91 93/77/23 40 22/73 32 31 49 47/ 9 20 72/74 9/
R65	(23) 98/90 91/87 88/72/24 60 27/79 51 50 48 44/12 26 73/63 3/
R75	(27) 90 94/87 86/66/21 62 27/80 53 51 49 46/ 1 40 82/57 6/
R64	(24) 96/71 62/69/42 72 62/78 32 30 27 16/33 30 71/38 37/
R74	(26) 76 67/63/32 73 54/81 40 38 36 28/ 9 35 85/38 31/
CH5	(3) 90/56/ 8 33 13/86 79 78 77 75/ 4 22 70/72 13/
R45	(23) 67/ 5 40 11/63 61 59 59 64/11 15 63/84 38/
SVVI	(33) 73 82 37/20 3 6 7 3/23 1 44/77 23/
CH6	(4) 82/51/18 66 67 69 69/41 3 11/20 11/
CH7	(5) 55/24 24 26 28 27/ 8 43 64/36 13/
ELAI	(8) 98 13 13 16 32/51 15 11 63/
CH4	(2) 79 79 77 63/13 32 68/29 34/

MSDI	(15) 99/99/95/20 17 43/36 9/	VARIABLE NO	OTHER BOUND OF CLUSTER	TY	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
SSDI	(32) 99/95/21 18 44/34 8/	AVI	1	36	35	34 64
SDI	(29) 96/23 16 42/35 10/	PV17	23	1	35	98 29
SBI	(29) 96/23 16 42/35 10/	GRADS	21	9	35	99 41
SNSI	(31) 41 19 43/47 34/	GV1	10	13	35	99 80
MNSI	(14) 64 38/ 8 46/	SGVI	10	10	35	97 43
NSI	(19) 80/13 23/	CLAI	6	27	35	99 29
R76	(28) 35 11/	GVBD	6	34	35	99 88
HYVI	(16) 69/	TV16	54	6	35	98 88
YVI	(36) /	ND7	18	35	35	99 16
		LAI	120	6	35	98 34
		ELAI	120	6	35	97 21
		CH5	120	6	35	98 22
		CH6	120	6	35	96 66
		CH7	120	6	35	97 43
		ELAI	120	6	35	90 95
		CH5	120	6	35	78 73
		CH6	120	6	35	93 64
		CH7	120	6	35	92 21
		ELAI	120	6	35	75 20
		CH5	120	6	35	95 07
		CH6	120	6	35	99 97
		CH7	120	6	35	99 92
		ELAI	120	6	35	44 27
		CH5	120	6	35	51 27
		CH6	120	6	35	80 19
		CH7	120	6	35	69 33
		ELAI	120	6	35	34 64

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Keith County - October 12, 1977 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

VARIABLE NO

AVI	(1) 99/97 97 97/94 95 90 90 90 94 93/86 84 94 92 94/79 89/37 8 35 52/27 51 45 60 9 10 11 9 70/12 42 67/
PVI7	(23) 95 95 94/93 94 88 88 88 92 83/88 84 94 92 95/78 87/39 6 35 49/19 43 52 69 17 18 20 17 84/11 41 69/
ND7	(16) 99/99/93 95 92 92 92 96 88/77 77 91 88 90/78 89/33 12 32 57/43 67 28 49 10 9 7 8 69/13 42 69/
TV17	(35) 99/93 95 92 92 92 95 88/77 77 90 88 89/77 88/33 12 31 57/42 67 28 48 10 9 7 8 69/14 43 69/
R75	(27) 93 95 92 92 93 96 89/77 77 90 88 69, 88/33 12 32 58/43 67 28 49 10 9 7 9 69/12 42 69/
CLAI	(6) 98/97 97 97/95/96/92 92 96 94 94/74 74/23 10 59 70/17 54 50 74 12 13 14 11 71/ 5 13 43/
LAI	(12) 98 98/98/95/89 91 97 96 96/82 81/35 3 48 61/26 78 46 60 6 7 8 9 69/ 9 17 47/
ND6	(17) 99/99/98/97/86 89 95 94 93/81 76/32 1 52 65/31 63 42 67 0 1 3 4 59/18 6 37/
TV16	(34) 99/98/97/88 89 93 94 93/81 76/32 1 52 65/32 63 42 67 0 1 3 4 59/19 6 37/
R63	(25) 93/97/86 89 93 94 92/80 76/30 0 32 66/31 63 41 66 0 1 2 3 59/17 7 37/
GV50	(11) 91/84 87 96 96 95/88 87/45 17 36 52/40 62 40 60 0 0 1 3 69/13 20 49/
OLAI	(20) 84 83 89 87 83/63 62/ 9 19 67 01/22 63 37 68 1 0 0 3 53/ 9 1 32/
GRAB8	(9) 79/93 93 93/69 62/27 20 64 56/19 19 79 92 48 49 50 46 86/17 0 26/
PV16	(21) 93 94 93/77 64/36 10 60 51/ 6 23 77 91 43 44 46 46 01/30 7 19/
GVI	(10) 99/99/87 82/46 7 43 50/18 43 61 76 22 23 25 27 78/19 13 41/
SGVI	(30) 99/69 82/21 11 42 45/19 40 63 76 24 25 27 31 78/23 9 37/
MGVI	(13) 68 84/31 61 40 44/16 37 64 76 27 23 29 32 82/10 16 43/
R64	(24) 87/80 52 2 9/44 40 45 49 8 9 11 26 63/38 13 37/
R74	(26) 68 52 8 14/34 31 26 31 7 6 4 3 63/ 3 53 7/
ELAI	(8) 89/47 50/40 2 32 14 14 13 16 38 42/44 16 22/
VVI	(36) 81 63/69 16 20 39 30 31 28 6 2/22 33 29/
HYVI	(16) 89/43 15 46 74 31 32 31 16 29/11 43 22/
R45	(23) 2 56 12 49 11 9 10 26 20/10 7 16/
CH4	(2) 80/58 45 82 82 81 67 26/ 2 37 45/
CH5	(3) 42 9 76 75 74 73 11/14 25 46/
CH6	(4) 91/90 90 91 90/83/38 24 11/

	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
SYVI	(33) 70 71 71 67/77/35 30 B/	NAME NO	3	29 17
		AVI	1	99 37
		PVI7	22	99 37
		ND7	23	99 39
		TV17	33	99 39
		R75	27	96 44
		CLAI	5	95 86
		LAI	12	98 90
		ND6	17	99 90
		TV16	34	98 24
		R63	23	97 69
		GV50	11	92 28
		OLAI	20	98 77
		GRAB8	9	98 39
		PV16	21	99 71
		GVI	10	90 00
		MGVI	13	89 97
		CH7	1	79 89
		R74	25	83 40
		ELAI	26	83 84
		VVI	56	87 34
		HYVI	16	87 76
		R45	20	80 42
		CH4	4	70 55
		CH5	3	91 10
		CH6	3	96 03
		SYVI	33	99 99
		MSBI	15	99 99
		SSBI	35	99 99
		SNSI	31	90 53
		CH7	3	94 66
		MNSI	14	94 66
		NSI	28	94 94
		R76	1	27 77

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Keith County - November 17, 1977 - Field

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Keith County - December 4, 1977 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD					
VARIABLE NAME	NO.				
AVI	1 11 99/96 97 74/83/63 72 72 73 72 80 81 72 82 75 65 39 58/71/20 53 20 11 7 6 5 9 43 24 41 47/24 49 0/				
PVI7	1 22/93 94 91/84/61 70 70 70 80 82 73 81 77 63 42 55/78/21 43 28 3 2 3 4 14 45 23 42 43/22 43 0/				
ND7	1 18/ 99/97/70/65 74 74 77 76 77 73 68 82 68 98 30 64/52/41 70 3 29 27 27 26 1 35 23 37 49/29 61 3/				
TV17	1 33/97/79/65 75 74 77 75 78 76 70 82 70 60 32 61/55/39 68 7 26 24 23 22 1 37 23 37 48/29 59 3/				
R73	1 27/77/64 73 72 77 76 73 47 81 63 56 28 60/49/43 72 0 31 30 29 28 3 34 23 37 40/29 62 3/				
R74	1 26/46 59 59 52 59 76 80 73 76 56 55 22 47/68/51 34 25 10 1 1 0 47 67 0 36 37/24 1 30/				
CLA1	1 61 78 78/77/73/70 86 89 71/89 93/82/73/36/17 43 53 22 13 14 15 34 68 44 41 32/60 47 3/				
ND6	1 17/99/59/98/95 91 94 97/89 93/73/77/41/28 50 48 17 6 7 8 9 37 72 40 30 20/50 45 6/				
TV16	1 34/98/77/73 91 93 97/89 93/76/74/42/27 49 49 18 7 8 9 38 72 40 31 21/50 44 6/				
OLA1	1 20/97/90 85 87 93/86 88/71/76/36/26 58 38 4 2 1 0 22 60 29 26 14/59 59 6/				
R65	1 23/94 90 92 96/07 91/72/83/39/31 53 44 13 2 3 4 33 71 38 28 18/49 48 6/				
QVI	1 10/99/99/98/91 94/73/72/60/30 39 37 29 16 17 19 30 82 37 17 10/30 28 22/				
MQVI	1 13/98/97/90 93/71/68/66/29 32 61 34 22 23 25 56 85 35 12 8/32 19 28/				
SVVI	1 30/96/08 93/71/70/56/32 33 62 37 21 22 24 40 88 40 26 20/24 17 32/				
QVBB	1 11/80 91/67/74/53/37 49 47 17 5 6 7 44 77 32 14 6/32 36 20/				
GRAB8	1 91 95/89/64/71 8 19 71 38 40 41 42 35 67 25 18 13/55 38 10/				
PVI6	1 21/90/67/57 6 19 74 40 38 39 40 53 82 51 40 35/45 24 10/				
SYVI	1 33/90/93/93 9 86 62 63 64 64 42 64 50 53 53/62 20 15/				
LAI	1 12/22/93 34 23 2 12 11 10 10 51 20 20 8/41 47 3/				
CH7	1 5/25 21 65 46 59 59 60 36 48 15 35 23/ 3 2 4/				
CH4	1 2) 70 41 40 71 71 68/21 31 18 0 22/39 2 6/				
CH5	1 3) 49 72 81 80 80/30 1 15 15 37/29 71 6/				
CH6	1 4) 91/89 89 90/68 72 53 45 36/20 27 13/				
SNSI	1 31/91 91 92/76 64 63 49 63/10 61 34/				
MSBI	1 13/99/97/49 38 32 29 47// 7 43 1/				
SSB1	1 32/99/49 38 32 30 48/ 9 42 2/				
SD1	(29/51 41 33 30 48/ 7 43)	NAME NO.	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
ELAI	(6) 86/73 40 50/37 64 75/	AVI	1	36	99 93
		PVI7	2	22	99 42
		ND7	18	27	99 27
		TV17	33	10	99 39
		R73	27	1	94 76
		R64	26	1	80 26
		CLA1	5	1	99 83
		MNSI	17	34	98 35
		TV16	34	6	98 09
		OLA1	20	6	97 38
		R65	25	6	97 34
		QVI	10	10	99 82
		QVBB	10	10	98 33
		GRAB8	11	6	93 33
		PVI6	21	6	91 03
		SVVI	21	6	79 33
		LAI	22	1	93 28
		CH7	23	1	93 28
		CH4	28	28	93 10
		CH5	29	29	90 20
		CH6	4	24	91 20
		SNSI	31	4	99 94
		MSBI	19	27	99 99
		SSB1	20	27	60 71
		SD1	20	27	50 02
		ELAI	8	28	65 29
		R64	24	28	95 18
		MNSI	14	28	95 10
		ND7	19	28	74 69
		TV16	16	16	79 64
		R45	23	16	28 93
		YVI	36	1	

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Keith County - March 22, 1978 - Field

NAME NO.		VARIABLE NO.		NAME	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI	(1)	97	98	96	94/73/73	65 65 65 77 70 74 76 47 30 38/ 3 21 49/33 46 19 30 29 29 4 40 3 12 14 31/ 6/	
ND7	(18)	99/99/97/77/72	64	64	64 65 74 67 76 76 51 36 41/ 8 24 32/21 31 1 15 14 14 13 20 48 14 13 7 26/ 7/		
R75	(27)	99/97/76/72	69	69	64 65 74 67 76 76 51 33 40/ 8 24 31/22 32 2 16 15 15 19 48 13 19 8 26/ 6/		
TV17	(39)	97/77/71	64	64	64 65 73 66 76 76 52 38 41/ 9 25 52/18 27 1 12 11 10 10 23 50 16 14 6 24/11		
PV17	(22)	73/73	63	63	63 64 71 63 74 75 57 35 40/13 25 50/ 4 15 14 0 2 2 3 37 59 27 20 3 25/ 6/		
R74	(26)	36	40	41	40 36 60 60 64 68 32 71 68/10 32 50/29 15 2 1 0 8 7 24 22 4 42 52 40/ 3/		
CLAI	(6)	96	96	96	98/91 06 91 89/90/43 58/30 44 18/ 3 23 23 5 1 2 2 15 78 34 39 13 48/ 1/		
ND6	(17)	99/99/99/95	93	95	93 93/92/59 71/57 36 30/13 25 22 7 1 0 0 8 72 51 47 2 31/ 0/		
TV16	(34)	99/99/93	93	96	93 93/92/59 71/57 36 30/13 23 22 7 1 0 0 8 73 31 47 2 31/ 1/		
R65	(25)	99/94	93	95	93 93/92/59 71/57 36 31/13 25 22 7 1 0 0 8 72 51 47 3 31/ 2/		
DLAI	(20)	93	91	94	90/91/53 65/52 55 29/10 25 22 5 1 0 0 8 74 52 53 3 38/ 1/		
QVI	(10)	99/97	98/81/66	77/57	41 13/39 -1 3 9 20 19 19 2 36 28 22 27 17/ 0/		
SQVI	(30)	96	97	80/73	03/66 47 20/37 39 5 5 19 19 18 4 33 27 15 35 7/ 1/		
QV88	(11)	98/87/73	82/53	38 12/19	24 21 8 2 1 0 15 68 42 25 19 11/ 1/		
MQVI	(19)	84/73	83/53	39 8/23	26 18 6 4 4 3 14 64 37 18 23 6/ 9/		
PV14	(21)	60	69/50	58 38/22	12 57 43 35 36 36 40 91 78 57 19 23/ 0/		
ELAI	(8)	97/68	33	21/15	3 31 33 13 13 14 21 37 27 27 34 57/ 1/		
R64	(24)	75	44	28/21	6 27 26 6 6 7 14 43 29 16 51 43/ 4/		
MNSI	(14)	84	75/36	27 1	2 18 18 17 32 14 13 4 50 23/ 8/		
NSI	(19)	94/ 0	6	22 18 6 6 6 19 35 44 44 1 14/ 6/			
R76	(28)	11	10	27 16 16 16 15 20 39 35 6 2/10/			
CH4	(2)	93	87	86 95 95 95/85/56	77/49 80 8/ 2/		
CH5	(3)	88	93	96 96 96 96/86/41	65/18 34 26/ 0/		
CH6	(4)	97/96	96	97/90/77	91/42 34 11/ 0/		
SNSI	(31)	97	97	97/87/62	81/25 43 29/ 1/		
MSBI	(15)	99/99/92/62	82/36	61 13/ 0/			
B881	(32)	99/92/63	82/36	62 12/ 0/			
SD1	(20)	92/63	02/35	60 17/ 3/			
AVI				1	2		99 36
ND7				ND2	18		99 96
R75				TV17	27	10	99 34
TV17				PV17	11		99 76
PV17				CLAI	16	24	7 11
CLAI				ND6	17	20	99 33
ND6				TV16	14	17	99 88
TV16				R65	17	17	97 18
R65				DLAI	5	6	99 11
DLAI				QVI	30	10	98 88
QVI				QV88	11	10	99 03
QV88				MCVI	10	6	99 10
MCVI				PV16	10	6	99 54
PV16				ELAI	14	24	99 76
ELAI				MNSI	14	20	99 76
MNSI				NSI	13	20	99 16
NSI				R76	19	20	99 36
R76				CH4	19	20	99 11
CH4				CH5	16	24	99 01
CH5				CH6	16	24	97 22
CH6				SNSI	15	20	99 00
SNSI				MSBI	15	20	100 00
MSBI				B881	15	20	99 31
B881				SD1	15	20	99 22
SD1				AVI	15	20	99 00
AVI				ND7	15	20	99 00
ND7				R75	15	20	99 00
R75				TV17	15	20	99 00
TV17				PV17	15	20	99 00
PV17				CLAI	15	20	99 00
CLAI				ND6	15	20	99 00
ND6				TV16	15	20	99 00
TV16				R65	15	20	99 00
R65				DLAI	15	20	99 00
DLAI				QVI	15	20	99 00
QVI				QV88	15	20	99 00
QV88				MCVI	15	20	99 00
MCVI				PV16	15	20	99 00
PV16				ELAI	15	20	99 00
ELAI				MNSI	15	20	99 00
MNSI				NSI	15	20	99 00
NSI				R76	15	20	99 00
R76				CH4	15	20	99 00
CH4				CH5	15	20	99 00
CH5				CH6	15	20	99 00
CH6				SNSI	15	20	99 00
SNSI				MSBI	15	20	99 00
MSBI				B881	15	20	99 00
B881				SD1	15	20	99 00
SD1				AVI	15	20	99 00
AVI				ND7	15	20	99 00
ND7				R75	15	20	99 00
R75				TV17	15	20	99 00
TV17				PV17	15	20	99 00
PV17				CLAI	15	20	99 00
CLAI				ND6	15	20	99 00
ND6				TV16	15	20	99 00
TV16				R65	15	20	99 00
R65				DLAI	15	20	99 00
DLAI				QVI	15	20	99 00
QVI				QV88	15	20	99 00
QV88				MCVI	15	20	99 00
MCVI				PV16	15	20	99 00
PV16				ELAI	15	20	99 00
ELAI				MNSI	15	20	99 00
MNSI				NSI	15	20	99 00
NSI				R76	15	20	99 00
R76				CH4	15	20	99 00
CH4				CH5	15	20	99 00
CH5				CH6	15	20	99 00
CH6				SNSI	15	20	99 00
SNSI				MSBI	15	20	99 00
MSBI				B881	15	20	99 00
B881				SD1	15	20	99 00
SD1				AVI	15	20	99 00
AVI				ND7	15	20	99 00
ND7				R75	15	20	99 00
R75				TV17	15	20	99 00
TV17				PV17	15	20	99 00
PV17				CLAI	15	20	99 00
CLAI				ND6	15	20	99 00
ND6				TV16	15	20	99 00
TV16				R65	15	20	99 00
R65				DLAI	15	20	99 00
DLAI				QVI	15	20	99 00
QVI				QV88	15	20	99 00
QV88				MCVI	15	20	99 00
MCVI				PV16	15	20	99 00
PV16				ELAI	15	20	99 00
ELAI				MNSI	15	20	99 00
MNSI				NSI	15	20	99 00
NSI				R76	15	20	99 00
R76				CH4	15	20	99 00
CH4				CH5	15	20	99 00
CH5				CH6	15	20	99 00
CH6				SNSI	15	20	99 00
SNSI				MSBI	15	20	99 00
MSBI				B881	15	20	99 00
B881				SD1	15	20	99 00
SD1				AVI	15	20	99 00
AVI				ND7	15	20	99 00
ND7				R75	15	20	99 00
R75				TV17	15	20	99 00
TV17				PV17	15	20	99 00
PV17				CLAI	15	20	99 00
CLAI				ND6	15	20	99 00
ND6				TV16	15	20	99 00
TV16				R65	15	20	99 00
R65				DLAI	15	20	99 00
DLAI				QVI	15	20	99 00
QVI				QV88	15	20	99 00
QV88				MCVI	15	20	99 00
MCVI				PV16	15	20	99 00
PV16				ELAI	15	20	99 00
ELAI				MNSI	15	20	99 00
MNSI				NSI	15	20	99 00
NSI				R76	15	20	99 00
R76				CH4	15	20	99 00
CH4				CH5	15	20	99 00
CH5				CH6	15	20	99 00
CH6				SNSI	15	20	99 00
SNSI				MSBI	15	20	99 00
MSBI				B881	15	20	99 00
B881				SD1	15	20	99 00
SD1				AVI	15	20	99 00
AVI				ND7	15	20	99 00
ND7				R75	15	20	99 00
R75				TV17	15	20	99 00
TV17				PV17	15	20	99 00
PV17				CLAI	15	20	99 00
CLAI				ND6	15	20	99 00
ND6				TV16	15	20	99 00
TV16				R65	15	20	99 00
R65				DLAI	15	20	99 00
DLAI				QVI	15	20	99 00
QVI				QV88	15	20	99 00
QV88				MCVI	15	20	99 00
MCVI				PV16	15	20	99 00
PV16				ELAI	15	20	99 00
ELAI				MNSI	15	20	99 00
MNSI				NSI	15	20	99 00
NSI				R76	15		

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Keith County - March 31, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

VARIABLE
NAME NO

		VARIABLE NAME NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
SBI	(29) 96/85/24	2 16/14 60 19/ AVI	1 18	35	26 .89
		ND7	18 27		.99 .81
		R75	27		.98 .93
SNSI	(31) 78/44 16	1/20 69 37/	1		.95 .96
		TV17	25		.95 .02
		R74	26		.91 .32
CH7	(5) 6 36 59/21 49 23/	CLAI	6 33		.97 .12
		OLA1	20 6		.97 .71
MNSI	(14) 68 75/16 23 41/	ND6	17 25		.93 .46
		TV16	24 17		.93 .39
		R63	25 6		.99 .28
NSI	(19) 93/50 14 2/	QVI	10 10		.98 .60
		SGVI	20 10		.98 .31
R76	(28) 37 14 3/	MGVI	15 10		.93 .43
		QV80	11 10		.96 .81
MYVI	(16) 81/76/	LAI	5 5		.94 .74
		GRADS	6 9		.92 .82
R45	(23) 79/	PVI6	21 9		.96 .93
		SYVI	33 1		.95 .48
YVI	(36) /	ELAI	8 24		.96 .59
		R64	24 1		.99 .99
		CH4	22 5		.99 .98
		CH5	31 5		.97 .50
		CH6	41 94 95 93 96/83/43 18 6/	31	.93 .29
		MSBI	15 15/13 60 17/		.96 .81
SSBI	(32) 99/96/64/23	2 15/12 59 17/			.94 .74
		NAME NO			.95 .82
		ND7			.96 .93
		R75			.95 .48
		TV17			.96 .59
		R74			.99 .99
		CLAI			.94 .98
		OLA1			.95 .27
		ND6			.96 .89
		TV16			.95 .29
		R63			.96 .50
		QVI			.97 .77
		SGVI			.95 .29
		MGVI			.95 .50
		QV80			.95 .50
		LAI			.95 .29
		GRADS			.95 .50
		PVI6			.95 .50
		SYVI			.95 .50
		ELAI			.95 .50
		R64			.95 .50
		CH4			.95 .50
		CH5			.95 .50
		CH6			.95 .50
		MSBI			.95 .50
		SSBI			.95 .50
		CH7			.95 .50
		MNSI			.95 .50
		NSI			.95 .50
		R75			.95 .50
		MYVI			.95 .50
		R45			.95 .50
		YVI			.95 .50

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Keith County - April 21, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

VARIABLE NO.

AVI	(1) 99/95/94 95 95 92 91 91 97 96 96 93 89 94 95 92/74 77/04 03 69/64 02 91/ 3 29 30/ 3 39 34 26 20 33 30/
PV17	(22) 96/94 94 95 90 90 90 96 95 95 93 89 94 95 92/75 77/02 01 63/63 02 91/ 4 30 26/ 4 36 55 28 31 33 31/
CH7	(5) 03 84 05 78 78 79 06 05 06 80 03 08 90 06/77 72/64 67 40/53 77 00/ 8 35 24/ 0 43 37 45 47 51 42/
CLAI	(6) 96 98 98 97/97/97 97 96/96 93 94 93 92/74 87/92 95 02/56 76 73/26 10 62/16 13 35 20 23 27 24/
CVB8	(11) 99 98 98 97/97 97 97 95/94 94 97 97 97/77 04/91 06 66/74 90 09/ 1 03 45/89 11 33 19 22 27 39/
LAI	(12) 99 99/97/98 98 96/96 95 97 96 96/77 86/92 91 73/66 04 05/11 25 39/24 11 34 21 24 28 31/
ND6	(17) 99/90/96 96 94/93 93 96 95 95/74 87/93 92 75/66 03 01/14 22 08/31 1 29 17 20 29 31/
TV16	(34) 97/96 96 94/95 95 96 94 95/76 07/93 92 75/66 03 01/14 22 08/31 1 25 17 20 24 30/
R65	(25) 93 95 96/94 94 95 94 94/77 07/91 93 77/64 03 01/17 22 07/30 3 29 20 23 27 32/
ND7	(10) 99/98/92 08 93 93 91/67 77/94 91 75/68 80 07/16 23 47/ 9 26 40 9 12 17 18/
TV17	(35) 97/92 08 93 93 91/67 77/94 90 73/68 80 06/16 22 47/10 29 48 9 12 16 18/
R75	(27) 91 87 92 92 90/67 76/91 90 75/67 80 07/18 20 45/ 7 28 49 11 14 10 18/
GRAB8	(9) 98/98 97 97/99 94/01 87 69/03 03 00/ 9 21 39/32 2 23 44 47 51 49/
PV16	(21) 90 97 90/92 94/79 83 63/58 07 79/ 0 29 36/46 9 11 46 48 52 57/
CVI	(10) 99/99/88 90/63 03 61/67 91 88/ 3 34 46/36 3 25 38 40 45 30/
MV1	(13) 99/88 09/01 80 38/68 92 90/ 7 40 42/34 9 28 39 44 46 52/
SVI	(30) 89 91/80 80 57/68 93 07/ 8 40 44/42 0 20 40 42 47 55/
CH6	(4) 93/50 61 39/39 01 67/18 04 46/57 21 6 75 76 79 82/
BYVI	(33) 69 81 66/36 74 61/11 10 71/52 26 7 37 39 61 60/
CH5	(3) 92 81/68 70 73/30 11 55/13 12 37 15 12 8 1/
OLAI	(20) 94/42 39 60/49 12 76/12 3 27 7 11 13 7/
R45	(23) 16 30 35/75 42 84/ 6 4 25 4 1 1 16/
CH4	(2) 85 85/42 77 15/31 18 33 17 16 9 22/
R64	(24) 92/38 69 14/51 0 17 31 33 39 60/
R74	(26) 29 64 3/15 37 92 18 19 25 37/
ELA1	(8) 87/71/40 2 11 27 25 29 38/

NAME	VARIABLE NO.	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI	1	31	35	99 04
PV17	22		14	99 43
CH7	5		10	96 00
CLAI	6		10	96 06
CVB8	7		10	98 88
LAI	12		10	99 29
ND6	17		10	99 97
TV16	34		6	97 78
R65	25		6	97 34
ND7	18		6	99 63
TV17	10		10	99 68
R75	27		10	98 13
GRAB8	9		10	98 77
PV16	21		10	98 57
CVI	10		10	99 03
MV1	30		10	93 73
SVI	33		10	91 85
CH6	4		10	92 03
BYVI	33		10	92 32
CH5	3		10	93 48
OLAI	20		10	92 73
CH4	4		10	92 57
R64	24		10	92 97
R74	26		10	93 92
ELA1	8		10	94 98
YVI	36/58/41 10 11 14 13 19 33		35	96 33
MYVI	16/22 39 21 21 24 22 5/		14	98 75
MNSI	14 82 74/39 40 42 73/		15	97 28
NSI	19 96/23 24 22 40/		15	97 04
R76	28/25 25 22 38/		15	98 04
MSBI	15 99/99/86/		15	96 33
SSBI	32/99/86/		15	97 28
SBI	29/88/		15	97 44
SNSI	31/		15	97 70

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Keith County - May 15, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD VARIABLE NO													
AVI	(1)	99/99 99/97/90 97 98 95 96 93 94 94 91/94 95/87 87 95/93/44 01/41 72/73 72 69 57/10 33 79/ 7 49/											
PVI7	(22)	99/98/97/97 97 97 95 95 96 96 94 94 94 90/93 92/87 86 93/94/42 00/42 71/71 70 68 56/11 54 80/ 8 40/											
ND7	(18)	99/99/98 98 98 97 97 96 96 94 96 94 91/96 49/88 87 94/90/47 81/88 72/76 75 73 60/ 8 30 77/ 3 37/											
TVI7	(33)	97/97/90 98 99 97 97 96 96 95 95 94 92/97 99/89 88 93/80/48 03/37 79/78 77 75 61/ 6 40 76/ 5 30/											
R73	(27)	97 96 95 95 94 94 94 92 96 92 89/93 94/91 44 04/39 70/72 71 68 59/12 52 79/ 0 36/											
CLAI	(6)	98 99 99 98/97 97 96/98/90 93/96 90/84 86 90/87/59 88/47 01/71 70 68 55/ 0 38 68/ 1 30/											
GV88	(11)	99/99 99/99 99 99 90/90/96 96/96 95/91 92 93/86/49 80/49 79/73 71 69 50/ 8 36 66/13 44/											
LAI	(12)	99/99 98 98 90/97/97 96/97 97/88 89 92/87/54 84/40 80/73 71 69 53/ 4 37 67/ 7 30/											
ND6	(17)	99/98 98 98/98/98 97/98 97/87 90 89/83/50 83/51 84/71 70 67 53/12 29 61/ 3 36/											
TVI6	(34)	98 98 98/98/97 97 97/87 89 89/82/58 84/50 84/72 71 68 50/12 28 61/ 6 36/											
QVI	(10)	99/99/97/98 90/94 94/80 93 92/87/51 70/57 84/66 65 62 42/13 30 61/16 44/											
MVVI	(13)	99/96/97 97/93 93/69 94 93/80/48 76/57 82/65 64 61 41/13 33 60/19 47/											
SVVI	(30)	96/97 98/93 92/88 95 91/85/50 75/60 83/64 62 59 37/20 24 37/20 47/											
R63	(29)	97 96/93 97/83 90 89/84/37 83/54 83/66 64 62 46/10 30 60/ 2 33/											
GRAB8	(9)	90/91 96/79 88 86/86/60 84/60 90/88 86 84 39/13 23 57/ 3 30/											
PVI6	(21)	90 93/81 91 84/81/81 78/68 92/56 55 52 31/27 14 40/13 37/											
CH5	(3)	99/90 83 87/77/54 84/30 72/83 84 83 67/ 0 38 68/ 1 34/											
DLAI	(20)	78 79 82/80/69 94/43 83/70 69 67 57/ 1 30 61/15 17/											
CH4	(2)	91 92/74/17 56/26 53/83 83 80 52/10 41 67/40 70/											
R64	(24)	92/80/26 55/61 74/57 56 52 21/31 23 51/44 67/											
RT4	(26)	92/17 69/39 39/70 69 65 46/ 5 37 72/30 63/											
CH7	(31)	27 66/48 62/50 49 46 39/21 63 62/10 42/											
HYVI	(16)	80/44 79/23 22 24 29/18 23 2/56 47/											
R45	(23)	30 75/63 61 62 63/15 29 56/47 14/											
CH6	(4)	82/20 22 26 45/60 32 10/26 24/											
SVVI	(33)	28 26 24 9/42 14 18/ 0 10/											
			VARIABLE NO	NAME	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED						
MS81	(15)	99/99/87/21 50 71/ 0 33/			36	33	99 93						
SS81	(32)	99/87/22 51 71/ 0 33/		AVI	1	1	99 93						
			PVI7	22	1		99 93						
			ND7	18	33		99 19						
			TVI7	25			97 99						
			RT4	27	21		99 44						
			CLAI	6	21		99 40						
			GV88	11	24		99 65						
			LAI	12	31		99 93						
			ND6	17	34		99 77						
			TVI6	34	30		99 88						
			QVI	10	10		99 93						
			MVVI	13	10		99 73						
			SVVI	20	21		99 94						
			R63	9	21		99 86						
			GRAB8	21			99 45						
			PVI6	21	20		99 60						
			CH5	20			99 62						
			DLAI	20	21		99 93						
			CH4	64	26		99 76						
			CH4	4	21		99 91						
			RT4	7	23		99 77						
			HYVI	23	21		99 44						
			R45	23	33		99 19						
			CH6	4	33		99 49						
			SVVI	33	31		99 27						
			MS81	19	31		99 84						
			SS81	29	33		99 00						
			SN81	14	28		99 33						
			MNS1	14	28		99 31						
			NS1	19	28		99 26						
			R76	28	36		99 04						
			ELAI	3	36								
			YVI	36									

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Keith County - May 16, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD																	
NAME	NO	ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	
AVI	1	99/99	90/97	97	90	96	96	97	97	93/95	97/94	93/94/92/03	09	94/94/81	76/25	74/21	30
PV17	2	22/98	98/97	97	97	96	95	96	97	93/94	97/94	42/93/92/04	89	94/89/62	76/29	74/21	57
N37	3	101	99/98	98	98	97	96	95/96	98/93	92/97	94/87	89	94/80/57	74/27	79/10	57	
TV17	4	33/98	98	99	98	98	96	96	95/95	98/93	92/98/90/00	88	92/00/59	74/60	77/19	57	
CLAI	5	61	97	99	98	98	98/97	96	96/97	96/97	96/95/97/00	86	88/08/07/05	84/42	03/	9	
GV90	6	111	99	99	99/99	98	98/96	96	95/95	96/94/99	90	94	94/00/64	78/23	73/29	63	
LAI	7	121	97	99/98	98	98/96	96/96	96/96/93	98/86	91	92/08/65	81/33	77/21	57	39/30	56	
ND6	8	171	99/90	90	90/97	93/96	97/96/96/96	98/96/96	91	90/03/66	03/36	78/20	57	44/50	53	51	
TV16	9	341	98	97	98/96	94/96	96/96/97/93/96	90	90/03/63	03/36	77/21	57	44/39	56	52	13	
QVI	10	101	99/97/96	94/97	98/93/92/06	94	92/97/73	63/30	71	29	62	48/49	47	41	0	17	
MQVI	11	131	99/96	95/97	98/92/91/87	95	94/91/73	83/26	69/32	65	47/49	46	41	0	19	04	
SGVI	12	301	96	93/97	98/92/90/07	95	92/00/73	05/27	68/33	65	32/40	46	40	3	13	47	
R65	13	251	98/93	95/92/99/81	91	90/87	69	83/35	80/15	94	41/50	47	43	7	19	32	
R75	14	271	92	91/92/94/03	89	93/91/60	74/26	78/14	36	27/36	34	30	18	36	67		
GRASS	15	71	99/09/94/74	87	85/40/79	92/46	79/14	47	44/37	33	30	2	11	47			
PV16	16	211	09/92/78	91	86/86/81	92/41	73/24	55	55/30	36	30	8	3	40			
CH5	17	31/93/89	85	08/78/46	70	30	77/16	55	32/75	73	69	34	28	63			
DLAI	18	20/72	78	80/81/60	84/54	94/	6	35	30/33	51	48	23	17	93			
CH4	19	21	92	93/2/40	30/12	43/36	66	41/73	73	70	17	30	61				
R64	20	241	96/84/69	72/	3	49/53	82	57/40	47	40	11	17	49				
R74	21	261	90/56	62/	2	51/45	78	34/38	07	51	7	41	67				
CH7	22	51/69	73/18	63/23	54	18/32	30	25	0	46	70						
CH6	23	41	90/41	44/26	37	67/20	22	28	61	20							
SVVI	24	331	66	74/	2	26	58/	0	5	0	26	22	12				
HYVI	25	161	74/67	51	11/	9	11	10	7	36	15						
R45	26	1231	44	2	4/42	40	39	30	16	45							
ELAI	27	81	07/53/15	15	16	10	42	1	7	NAME	NO	0	BOUNDARY	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED		
AVI	28									AVI	1	28	35	30	06		
PV17	29									PV17	22	31	35	99	95		
ND6	30									ND6	19	33	35	79	84		
MNS1	31									MNS1	1	10	34	79	83		
CLAI	32									CLAI	5	30	34	98	10		
LA1	33									LA1	12	32	34	99	66		
RD5	34									RD5	17	34	34	99	92		
TV16	35									TV16	10	30	34	98	55		
JV14	36									JV14	10	30	34	99	50		
MOV1	37									MOV1	10	30	34	97	31		
SGVI	38									SGVI	20	27	31	98	34		
R65	39									R65	27	32	31	95	24		
GRASS	40									GRASS	21	21	14	95	24		
PV16	41									PV16	21	21	14	94	24		
CH5	42									CH5	20	21	14	94	02		
DLAI	43									DLAI	20	21	14	92	71		
CH4	44									CH4	22	26	26	88	71		
R64	45									R64	22	26	26	87	33		
R74	46									R74	24	26	26	90	63		
CH7	47									CH7	26	30	24	71	49		
CH6	48									CH6	24	30	24	74	60		
SVVI	49									SVVI	16	23	24	85	05		
HYVI	50									HYVI	16	23	24	87	71		
R45	51									R45	20	26	26	99	94		
ELAI	52									ELAI	20	14	24	99	94		
VVI	53									VVI	16	8	24	99	94		
MNS1	54									MNS1	14	1	24	99	49		
MSB1	55									MSB1	15	28	28	99	49		
SSB1	56									SSB1	15	15	15	99	67		
SB1	57									SB1	15	21	21	99	67		
SNS1	58									SNS1	19	20	21	99	68		
NS1	59									NS1	19	20	21	99	68		
R76	60									R76	20	21	21	99	06		

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Keith County - May 25, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD																
	NAME	NO	VARIABLE	NAME	NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED								
AVI	(1)	99/98	70/77/77	97	90	96	96	93/93/92	90	96	96	93/83	94/79	70/80/03/56	55 57 43/23 67/ 0 54 01/ 7 36 39/	
PV17	(22)	98	97/97	97	96	97	95	95	94/92/93	91	96	96	94/86	94/77	87/79/09/32	31 49 42/20 66/ 8 55 01/ 6 36 39/
ND7	(18)	99/98/98	98	98	97	97	97	97/93	90	89	95	95	93/06	93/82	93/04/79/63	62 60 52/17 61/ 7 53 80/12 36 39/
TV17	(33)	97/98	98	98	98	97	97	97/93	90	89	95	95	93/06	93/82	93/04/79/66	63 63 53/14 53/ 7 52 80/11 36 40/
R73	(27)	97	97	97	96	95	95	97/93	90	88	94	94	92/06	92/80	09/04/81/57	66 54 47/21 62/ 8 53 79/13 33 39/
CLAI	(41)	97	97	99	98	98/97	98/93	93	96	95	95/03	88/74	91/88/80/55	54 52 46/27 79/ 1 41 7/19 24 34/		
GV38	(11)	99	99	99/99	99/92	93	90	90	97/92	94/84	92/79/70/60	58 56	43/23	67/ 9 40 7/ 1 44 39/		
LAI	(12)	99	99/98	98/94	94	94	90	97	97/80	91/01	93/03/79/50	57 55	45/26	67/ 3 41 7/ 9 35 45/		
ND6	(17)	99/98/97	93	94	97	96	96/08	09/01	93/04/79/59	58	56	45/26	71/ 9 34	66/10 34 48/		
TV16	(34)	98/97/93	94	97	94	96/07	08/01	94/84/74/60	59	57	46/23	70/ 9 34	66/10 34 49/			
R65	(23)	96/96/93	93	96	96	95/00	90/07	89/04/77/53	52	50	50/39/31	72/ 9 35	66/12 34 47/			
DLAI	(20)	91	89	92	90	90/76	01/70	91/70/50	57	56	52/20	79/ 3 33	66/22 14 61/			
GRASS	(9)	98/96	96	96/03	82/60	70/00/06/50	29	26	19/54	80/14	25	56/11	22 39/			
PV16	(21)	97	97/88	88/64	78/74	02/32	30	28	19/55	87/27	16	50/ 0	32 33/			
GV1	(10)	99/99/92	92/78	87/73/62	47	46	43	30/40	76/17	33	64/ 3	42 42/				
MV1	(13)	99/93	93/78	05/13/05/45	44	41	27/42	75/16	35	63/ 6	45 39/					
GOVI	(30)	94	91/78	03/72/02	45	44	41	23/43	77/22	29	60/ 8	46 37/				
R64	(24)	94/94	76/51/73/44	43	39	16/39	03/03	28	26/34	69	12/					
R74	(26)	96	82/60/03/59	54	51	03/23	01/ 2	36	79/17	62	10/					
CH4	(2)	89/50/47/03	82	80	80/20/13	23/10	45	67/20	71	3/						
CH5	(3)	82/82/53/83	82	81	71/ 9	43/ 5	43	72/19	34	39/						
R45	(23)	57/53	52	52	59/ 9	63/23	34	60/61	16	76/						
CH7	(5)	10/10	8	6	3/57	70/ 9	52	70/ 3	30	27/						
MGB1	(15)	99/99/91/59	9/22	49	69/12	34	5/									
GGDI	(32)	99/99/91/61	10/23	49	62/11	33	3/									
GGI	(29)	93/63	12/25	49	61/14	31	4/									
SNB1	(31)	71	17/54	58	64/44	0 19/	NAME	NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED					
AVI	1						AVI	1	16		28 42					
PV17	2						ND7	18	05		99 88					
ND7	18						TV17	25			99 65					
TV17	25						R73	27			78 47					
R73	27						CLAI	6	25		98 12					
CLAI	6						GV38	11	24		99 17					
GV38	11						LA1	12	34		99 54					
LA1	12						ND6	17	34		99 95					
ND6	17						TV16	34	6		99 24					
TV16	34						R65	34			99 43					
R65	34						DLAI	20			93 10					
DLAI	20						GRASS	29	30		97 10					
GRASS	29						PV16	21	30		98 76					
PV16	21						GV1	10	30		99 77					
GV1	10						MV1	13	10		99 85					
MV1	13						GOVI	30			94 70					
GOVI	30						R74	24	26		99 00					
R74	24						CH4	16	5		99 27					
CH4	16						CH5	5	5		99 26					
CH5	5						R45	23			78 69					
R45	23						CH7	19			99 98					
CH7	19						MGB1	5	5		99 90					
MGB1	5						GGDI	31	15		99 07					
GGDI	31						GGI	31	33		99 01					
GGI	31						SNB1	32			99 91					
SNB1	32						MV1	14	20		99 73					
MV1	14						NSI	19	20		99 80					
NSI	19						R76	28	16		99 85					
R76	28						ELAI	8	16		99 40					
ELAI	8						YVI	36	10		99 42					
YVI	36						MV1	16	10							

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Keith County - June 11, 1978 - Field

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Keith County - June 21, 1978 - Field

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Keith County - June 29, 1978 - Field

TREE PRINTED OVER ADDITIVE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD															
NAME	NO	NAME	NO	NAME	NO	NAME	NO	NAME	NO	NAME	NO	NAME	NO	NAME	NO
AVI	1	11	97/99/99/99/99/99/93	91	90	91	90	89	94	94	94	94	91	93/79/89/89/87/85	64
ND7	1	181	99/99/99/97	43	91	91	92	91	90	94	94	94	91	93/60/69/65	64
PV17	1	221	79/79/96	93	90	87	90	89	80	93	92	94	91	93/79/82/04	64
TV17	1	351	69/67	92	90	90	90	89	94	94	94	91	93/79/89/86	64	
R79	1	271	97	93	91	91	92	92	90	94	94	94	91	94/81/89/83	64
CLAI	1	61	98/97	97	97	97	96/97	97	97	95/96/97/86	91/87/86	66	74/69/70	74	43/22
GRAD5	1	91	98	98	98	98	98/97	96	93	93/95/95/96	02/84	64	67/79/77/62	77	50/12
ND6	1	171	79/79/79/79/79/98	98	96	97/96/74/87/89	72	68/70/73/79	71	41/26	6	2	2	13	20
TV16	1	341	79/79/79/79/78	90	96	97/96/79/87/89	72	68/70/73/79	71	41/26	6	2	2	12	20
R69	1	251	79/79/78/90	98	96	97/96/99/97/87/87	71	69/71/73/79	72	43/25	6	2	2	13	18
CLAI	1	201	78/76	76	94	93/93/93/00/03	64	69/68/71/65	78	50/18	7	7	3	18	14
PV16	1	211	79	98	97	93	76/01/09	74	68/73/00/77	60	39/22	4	8	8	2
SVI	1	101	79/79/79/79/79/79	64/64/63	79	79/79/79/79/79	70	62	30/33	4	0	0	7	17	14
GV88	1	111	79/79/79/79/79/06/93	79	79/77/73/70	62	39/37	8	4	3	10	17	14	02	
M0VI	1	131	79/79/79/87/01/44	82	83/81/74/64	97	24/37	1	2	3	3	17	9	03	
GOV1	1	301	74/87/01/95	84	80/76/77/53	56	23/39	1	1	3	1	25	18	24	
LAI	1	121	88/83/87	72	76/78/71/71	66	33/27	5	1	1	13	10	10	33	
DYVI	1	331	72/74	57	48/65/03/07	78	55	3	17	22	21	0	23	39	
CH3	1	31	74	53	60/48/31/76	73	47/40	02	49	49	06	2	8	34	
ELAI	1	81	90/84/72/70/48	36	3/54	6	3	0	4	21	13	28			
R64	1	241	84/84/67/10	4	31/70	1	3	7	30	34	20	11			
R74	1	261	03/51/17	15	16/65	10	8	5	0	1	31	62			
CH7	1	51	70/40	43	19/11	27	30	31	7	22	33	67			
CH4	1	41/50	30	13	4	60	63	64	53	42	36	4			
MWVI	1	161	79/86/24	7	3	7	30	3	35	1					
R49	1	231	79/32	11	7	11	50	26	15	20					
YVI	1	361/54	6	2	8	33	40	12	10	NAME	NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEM IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED	
AVI	1	1	20											89/40	
ND7	1	181												99/79	
PV17	1	221												99/61	
R79	1	271												99/39	
CLAI	1	61												99/30	
GRAD5	1	91												99/35	
ND6	1	171												99/97	
TV16	1	341												99/49	
R69	1	251												99/27	
CLAI	1	201												99/34	
PV16	1	211												99/33	
SVI	1	101												99/31	
GV88	1	111												99/25	
M0VI	1	131												99/23	
GOV1	1	301												99/20	
LAI	1	121												99/16	
DYVI	1	331												99/14	
CH3	1	31												99/03	
ELAI	1	81												99/01	
R64	1	241												99/00	
R74	1	261												99/00	
CH7	1	51												99/00	
CH4	1	41/50												99/00	
MWVI	1	161												99/00	
R49	1	231												99/00	
YVI	1	361/54	6	2	8	33	40	12	10	NAME	NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEM IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED	
AVI	1	1	20											89/40	
ND7	1	181												99/79	
PV17	1	221												99/61	
R79	1	271												99/39	
CLAI	1	61												99/30	
GRAD5	1	91												99/35	
ND6	1	171												99/97	
TV16	1	341												99/49	
R69	1	251												99/27	
CLAI	1	201												99/34	
PV16	1	211												99/33	
SVI	1	101												99/31	
GV88	1	111												99/25	
M0VI	1	131												99/23	
GOV1	1	301												99/20	
LAI	1	121												99/16	
DYVI	1	331												99/14	
CH3	1	31												99/03	
ELAI	1	81												99/01	
R64	1	241												99/00	
R74	1	261												99/00	
CH7	1	51												99/00	
CH4	1	41/50												99/00	
MWVI	1	161												99/00	
R49	1	231												99/00	
YVI	1	361/54	6	2	8	33	40	12	10	NAME	NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEM IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED	
AVI	1	1	20											89/40	
ND7	1	181												99/79	
PV17	1	221												99/61	
R79	1	271												99/39	
CLAI	1	61												99/30	
GRAD5	1	91												99/35	
ND6	1	171												99/97	
TV16	1	341												99/49	
R69	1	251												99/27	
CLAI	1	201												99/34	
PV16	1	211												99/33	
SVI	1	101												99/31	
GV88	1	111												99/25	
M0VI	1	131												99/23	
GOV1	1	301												99/20	
LAI	1	121												99/16	
DYVI	1	331												99/14	
CH3	1	31												99/03	
ELAI	1	81												99/01	
R64	1	241												99/00	
R74	1	261												99/00	
CH7	1	51												99/00	
CH4	1	41/50												99/00	
MWVI	1	161												99/00	
R49	1	231												99/00	
YVI	1	361/54	6	2	8	33	40	12	10	NAME	NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEM IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED	
AVI	1	1	20											89/40	
ND7	1	181												99/79	
PV17	1	221												99/61	
R79	1	271												99/39	
CLAI	1	61												99/30	
GRAD5	1	91												99/35	
ND6	1	171												99/97	
TV16	1	341												99/49	
R69	1	251												99/27	
CLAI	1	201												99/34	
PV16	1	211												99/33	
SVI	1	101												99/31	
GV88	1	111												99/25	
M0VI	1	131												99/23	
GOV1	1	301												99/20	
LAI	1	121												99/16	
DYVI	1	331												99/14	
CH3	1	31												99/03	
ELAI	1	81												99/01	
R64	1	241												99/00	
R74	1	261												99/00	
CH7	1	51												99/00	
CH4	1	41/50												99/00	
MWVI	1	161												99/00	
R49	1	231												99/00	
YVI	1	361/54	6	2	8	33	40	12							

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Keith County - July 27, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERED BY AVERAGE DISTANCE METHOD		NAME NO.	VARIABLE NO.	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED																								
AVI	PVI7	TV17	ND7	R75	CLA1	ND6	TV16	OLAI	R65	GVI	MGVI	BGVI	GVBB	GRABB	PV15	R64	R74	SYVI	LAI	CH6	CH7	HYVI	R45	YVI	CH4					
(1) 99/99/99/99 97/95 93 93 93 93 95 95 95 91 90/77 91/69/60/23 64/59 74 3/56 62 41 39 30 38/54 8 12 69/	(22) 99/99 97/95 93 92 93 93 95 95 93 95 92 91/78 91/72/70/30 70/59 73 6/51 77 34 32 31 32/54 7 13 69/	(35) 98 96/94 92 92 92 91 94 94 92 94 90 89/76 90/67/66/23 65/58 73 5/55 81 40 39 38 38/54 5 15 65/	(18) 99/96 94 93 94 93 93 93 93 93 96 91 90/78 91/71/72/27 66/59 76 6/53 80 37 36 35 35/52 8 11 62/	(27) 95 94 92 94 96 94 93 92 95 91 90/78 90/71/73/20 66/59 77 7/51 78 35 33 32 33/48 9 9 59/	(6) 99 99 99/90/97 96 96 98/97 97/80 83/84/65/27 62/72 80 13/46 78 30 20 20 27/53 24 14 40/	(17) 99/99/90/90 97 97 95/96 98/84 84/85/65/39 60/68 75 8/49 77 30 28 27 23/61 34 21 33/	(34) 99/97/90 97 97 98/95 98/84 83/84/63/40 59/68 73 8/49 78 30 28 27 23/62 35 23 31/	(20) 98/97 96 96 98/96 97/62 82/83/65/38 59/70 79 11/47 78 30 29 28 29/57 30 20 34/	(29) 96 95 98/93 96/04 83/81/71/39 61/66 77 8/48 76 29 27 26 23/56 29 16 37/	(10) 99/99/99/94 97/09 90/77/66/36 62/58 68 3/57 79 34 32 31 24/69 35 13 40/	(13) 99/99/93 7/91 92/77/60/40 64/53 63 8/57 75 30 28 27 19/72 36 10 42/	(30) 99/92 97/92 90/76/66/38 61/53 62 10/59 77 32 30 29 19/74 42 16 36/	(11) 94 97/09 90/77/60/38 63/59 69 2/55 77 31 30 28 22/67 34 13 40/	(7) 98/74 70/92/64/54 73/76 79 24/27 64 10 8 8 11/53 22 17 34/	(21) 83 81/83/63/52 67/68 71 9/40 68 17 15 14 10/65 39 26 24/	(24) 90/63/63/45 58/22 31 41/62 88 20 19 16 4/89 63 21 23/	(26) 74/72/29 68/25 44 31/65 68 32 31 29 18/72 24 19 62/	(33) 50/73 71/80 72 39/ 3 37 20 22 22 16/42 29 41 4/	(12) 51 60/29 48 6/33 45 12 11 10 9/35 8 15 47/	(4) 76/29 13 12/39 23 74 75 76 75/41 37 37 17/	(5) 54 39 10/ 8 10 38 40 41 35/43 1 20 47/	(16) 93/74/ 7 52 10 8 10 30/ 3 8 31 9/	(23) 64/12 68 29 27 29 48/ 2 18 7 36/	(36) /39 0 19 21 18 16/61 53 8 /	(2) 79 83 83 82 58/59 36 8 37/	CH5	NAME NO.	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
MSBI	(15) 99/99/92/11 2 17 39/	AVI	1	28	35	99 92																								
MSBI	(15) 99/99/92/11 2 17 39/	PVI7	29	1	35	99 68																								
SSBI	(32) 97/91/11 2 18 38/	TV17	18	27	1	99 26																								
SSBI	(32) 97/91/11 2 18 38/	ND7	27	21	1	99 22																								
SBI	(29) 92/ 8 4 18 38/	ND6	16	21	1	98 07																								
SBI	(29) 92/ 8 4 18 38/	TV16	16	17	1	97 62																								
SNSI	(31) 19 35 29 48/	OLAI	16	6	1	99 31																								
SNSI	(31) 19 35 29 48/	R65	15	6	1	98 48																								
SNSI	(31) 19 35 29 48/	GVI	10	11	1	99 39																								
ELAI	(8) 74/26 6/	MGVI	10	10	1	99 69																								
ELAI	(8) 74/26 6/	BGVI	10	10	1	97 67																								
MNSI	(14) 76 56/	GBSD	9	21	1	98 19																								
MNSI	(14) 76 56/	PV16	1	21	1	93 66																								
NSI	(19) 84/	R64	14	26	1	90 09																								
NSI	(19) 84/	R74	14	26	1	83 36																								
NSI	(19) 84/	SYVI	14	26	1	76 26																								
R76	(20) /	LAI	14	26	1	76 03																								
R76	(20) /	CH6	14	3	1	51 59																								
CH7	(5) 54 39 10/ 8 10 38 40 41 35/43 1 20 47/	CH7	16	16	1	70 42																								
HYVI	(16) 93/74/ 7 52 10 8 10 30/ 3 8 31 9/	HYVI	16	16	1	62 39																								
R45	(23) 64/12 68 29 27 29 48/ 2 18 7 36/	R45	16	16	1	44 33																								
YVI	(36) /39 0 19 21 18 16/61 53 8 /	YVI	16	16	1	77 64																								
CH4	(2) 79 83 83 82 58/59 36 8 37/	CH4	16	31	1	80 64																								
CH4	(2) 79 83 83 82 58/59 36 8 37/	CH5	16	31	1	92 22																								
MSBI	(15) 99/99/92/11 2 17 39/	MSBI	16	31	1	99 98																								
SSBI	(32) 97/91/11 2 18 38/	SSBI	16	31	1	99 79																								
SBI	(29) 92/ 8 4 18 38/	SBI	16	31	1	97 05																								
SNSI	(31) 19 35 29 48/	SNSI	16	31	1	41 26																								
ELAI	(8) 74/26 6/	ELAI	16	31	1	74 26																								
MNSI	(14) 76 56/	MNSI	16	31	1	84 26																								
NSI	(19) 84/	NSI	16	31	1	92 26																								
R76	(20) /	R76	28	28	1	93 26																								

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Yolo County - October 7, 1977 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD									
NAME	VARIABLE NO	NAME	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED			
AVI	(1) 74 77 92/31 52/64 67 65 71 76 72 75 24 38 26 44 51 50 50 59 56 49 66 / 8 19 32 34 34 35 48 54 21 54 / 8								
ND7	(18) 99/92/79 89/64 59 55 55 75 63 70 26 35 11 12 24 42 30 15 16 46 50/50 72 35 33 33 22 15 9 27								
R75	(27) 93/76 83/70 65 62 62 61 68 75 31 40 17 20 31 30 38 21 24 49 55/47 68 30 27 27 27 8 2 19 8/10								
PV17	(22) 59 73/70 69 66 69 82 76 81 32 43 24 33 43 57 46 39 41 52 64/26 49 3 2 1 1 16 23 1 29 / 2								
R74	(26) 84/31 21 19 9 39 21 36 1 1 22 27 11 7 2 45 36 0 8/57 85 47 66 66 66 57 36 49 33/34								
TV17	(35) 53 26 22 21 43 34 42 1 7 15 19 6 9 2 8 15 23 24/52 74 47 49 49 48 39 33 50 26/14								
CLA1	(6) 99/97/95/96/90 92/77 82 72 77 61 93 87/42 69 65/72/30 36 5 5 6 7 33 35 41 55 / 9								
OLAI	(20) 99/98/96/92 92/78 84 76 83 85 95 90/53 77 68/76/22 27 4 16 16 17 43 46 48 62 / 1								
TV16	(34) 96/44/90 91/8 84 76 85 86 96 91/51 78 65/19/19 24 6 10 10 19 45 47 52 65 / 9								
ELAI	(8) 93/92 89/75 83 76 85 84 93 88/67 84 73/80/15 17 15 25 25 27 51 55 49 65 / 13								
R76	(28) 89 92/66 74 60 60 73 87 79/46 65 64/73/28 40 3 5 5 6 31 35 36 50 / 6								
MNS1	(14) 97/84 91 81 80 87 91 86/59 79 82/71/33 34 0 10 10 12 40 45 41 38/10								
NS1	(19) 79 83 73 75 84 91 83/45 70 69/68/31 40 4 6 6 8 35 39 40 38 / 9								
GV1	(10) 98/96/83 87 86 87/37 71 75/48/43 29 16 2 2 0 28 28 32 49 / 2								
SV1	(30) 96/87 91 90 90/48 73 31/57/30 26 8 5 5 7 36 38 33 33 / 9								
MGV1	(13) 91 92 84 88/53 83 74/50/2 7 8 21 22 23 49 49 67 63/17								
CVSD	(11) 96/93 96/64 94 61/59/6 14 33 47 47 48 71 71 80 83/10								
PV16	(21) 93 96/53 88 61/58/0 3 26 40 40 41 66 66 77 84 / 2								
ND6	(17) 79/52 84 64/66/13 15 12 25 26 27 53 54 65 74 / 6								
R65	(25) 50 84 58/57/6 5 17 31 32 33 58 57 73 78 / 9								
R45	(23) 84/69/63/19 32 57 58 58 60 70 77 40 36/70								
R64	(24) 69/63/14 24 48 58 58 59 79 81 72 81/34								
YVI	(36) 61/52 33 11 6 6 4 19 28 11 22/37								
LAI	(12) 11 14 16 21 21 22 39 45 26 43/22								
CH4	(2) 91/90 87 87 86 69 45/53 52 / 2								
CH7	(5) 89 86 86 86 70 66/56 47/25 NAME VARIABLE NO	NAME	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED			
CH5	(3) 98 98 98/89 88/63 69/28 AVI	AVI	1	18	32	93 17			
		ND7	19	22		93 19			
		R75	27	18		99 26			
MSOI	(15) 99/99/94 93/73 80/21 PV17	PV17	23			81 73			
		R74	25	35		64 18			
SSOI	(32) 99/94 92/75 80/20 CLA1	CLA1	20	12	15	88 07			
		OLAI	26	5		97 03			
		TV16	33	1		98 48			
SD1	(29) 93 93/76 80/22 ELAI	ELAI	38	5		96 35			
		R76	28	6		93 40			
		MNS1	14	19		91 54			
CH6	(4) 99/86 93/20 NS1	NS1	10	20		88 33			
		SCV1	30	10		98 65			
SNS1	(31) 80 90/30 MGV1	MGV1	15	10		95 30			
		CVSD	11	25		95 31			
GRADS	(9) 93/12 PV16	PV16	21	11		59 26			
		ND6	17	20		59 27			
		R65	13	6		62 37			
		R45	33	6		69 30			
		R64	34	23		84 84			
SYVI	(33) 7 YVI	YVI	36	6		66 92			
		LAI	25	1		52 35			
HYVI	(16) / CH4	CH4	33	1		92 89			
		CH7	27	1		99 98			
		CH5	1	29		100 00			
		MSOI	1	29		99 00			
		SSOI	1	29		99 23			
		SD1	4	5		81 21			
		OLAI	31	5		93 67			
		SHS1	31	30		94 76			
		GRADS	33	30		24 76			
		SYVI	33	1		17 47			

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Yolo County - November 12, 1977 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD		NAME NO.	VARIABLE NO.	NAME	BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
1	2						
AVI	1 1	06/35 36 33/56 64 51 36 36 36 38 33 31 7 54 4 35 4 7 6 8 0 1 63 4			36	33	0.94 0.89/22 21 23 0.7
PV17	1 22)	32 31 33/10 16 2 7 7 7 9 13 4 9 30 23 30 9 30 30 37 39 33 37 60 37 64 73 74	22		1	14	1 18 6
MNSI	1 14)	79/56/17 33 46 36 36 37 48 27 62 74 32 31 37 44 50 57 59 59 59 61 46 64 58 1 1 0.730 0 24 46	14		28	1	
NSI	1 19)	70/20 24 39 31 31 31 33 14 34 46 4 7 49 56 47 63 62 64 59 65 36 46 37 12 13 13/61 25 35 12	19		36	1	
R76	1 20)	11 13 6 11 11 11 6 30 3 1 30 15 2 6 4 16 16 16 13 15 10 15 2 64 64 58/67 47 27	20		36	1	
CH4	1 21)	94 93 95 96 95 90 91/56 60 38 43/76 89 50 48 48 50 57 20 9 12 47 46 43/ 8 33 10 42	21		36	1	
CH5	1 3)	96 98 98 98 98/95/70 73 72 70/66 03 61 44 44 43 48 53 20 3 18 45 45 41/22 45 22 9	3		36	1	
CH6	1 4)	99 99 99/99/96/76 84 76 63/82 93 77 64 64 64 66 73 4 20 40 55 55 52/ 4 37 9 12	4		36	1	
MSDI	1 15)	77/99/99/99/72 78 74 64/76 90 49 55 55 55 58 64 8 7 20 52 52 49/12 40 11 16	15		36	1	
SSDI	1 32)	99/99/98/97/72 78 73 64/77 90 69 55 55 55 58 64 8 7 20 52 52 49/12 40 11 16	32		36	1	
SDI	1 27)	98/97/72 79 74 64/76 90 69 55 55 55 58 64 7 8 29 52 52 49/12 40 12 15	27		36	1	
SNSI	1 31)	70 05 77 72/74 87 72 57 57 57 60 66 2 15 35 50 50 47/12 41 21	31		36	1	
CH7	1 31)	72 78 84 63/78 86 73 36 36 35 38 64 0 14 38 68 68 63/18 43 16 11	31		36	1	
ELAI	1 8)	92/01/03/58 65 02 65 65 64 73 63 24 41 54 55 54 40/17 47 35 28	8		36	1	
R64	1 24)	74/77/70 75 89 75 75 80 77 37 55 60 50 57 53/ 0 37 33 39	24		36	1	
R74	1 26)	74/61 61 78 55 55 55 60 57 26 38 59 60 83 70/32 55 44 27	26		36	1	
R45	1 23)	20 36 46 20 20 19 30 23 11 9 22 28 27 22/31 37 74 35	23		36	1	
GRADS	1 9)	94/07 88 87 88 84 94/46 31 66/70 71 70/33 11 33 38	9		36	1	
SYVI	1 03)	01 79 78 79 77 07/22 32 40/56 36 34/22 10 24 36	03		36	1	
GV50	1 11)	94 94 94 96/91/59 69 81/76 76 72/21 24 2 1	11		36	1	
ND6	1 17)	99/99/98/95/68 74 61/64 64 61/49 2 28 14	17		36	1	
TV16	1 34)	99/98/94/67 73 00/64 64 60/48 0 28 13	34		36	1	
R65	1 25)	97/96/70 76 82/63 64 61/49 1 29 14	25		36	1	
OLAI	1 20)	90/62 70 77/64 64 59/41 10 19 7	20		36	1	
PV16	1 21)	66 74 82/61 62 62/43 3 27 15	21		36	1	
QVI	1 10)	97/91/45 46 49/53 19 19 19	10		36	1	
SGVI	1 30)	96/45 46 49/47 11 4 31	30	NAME NO.	NAME	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
PV17	1 22)		22	AVI	1	36	0.93
MNSI	1 14)		14		28	1	0.95
NSI	1 19)		19		14	1	0.95
R76	1 20)		20		36	1	0.95
CH4	1 21)		21		36	1	0.95
CH5	1 3)		3		36	1	0.95
MSDI	1 15)		15		36	1	0.95
SSDI	1 32)		32		36	1	0.95
SDI	1 27)		27		36	1	0.95
CH6	1 4)		4		36	1	0.95
ELAI	1 8)		8		36	1	0.95
R64	1 24)		24		36	1	0.95
R74	1 26)		26		36	1	0.95
R45	1 23)		23		36	1	0.95
GRADS	1 9)		9		36	1	0.95
SYVI	1 03)		03		36	1	0.95
GV50	1 11)		11		36	1	0.95
ND6	1 17)		17		21	1	0.95
TV16	1 34)		34		17	1	0.95
R65	1 25)		25		17	1	0.95
OLAI	1 20)		20		17	1	0.95
PV16	1 21)		21		16	1	0.95
QVI	1 10)		10		13	1	0.95
SGVI	1 30)		30		10	1	0.95
MGVI	1 13)		13		9	1	0.95
ND7	1 18)		18		18	1	0.95
R75	1 27)		27		18	1	0.95
TV17	1 35)		35		18	1	0.95
CLAI	1 6)		6		16	1	0.95
R74	1 24)		24		16	1	0.95
GR08	1 9)		9		16	1	0.95
LAI	1 12)		12		16	1	0.95
MYVI	1 16)		16		16	1	0.95
VVI	1 36)		36		16	1	0.95

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Yolo County - January 28, 1978 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

NAME NO

AVI	(1) 99/96 95 97 96 97/90 96/93/83 89/83 83 94 94 91 90 96 94 94 97/63/24 98 80 61 62/26 53 30/44 3 37/27/
PV17	(22) 96 93 97 96 97/91 96/93/83 90/83 80 94 92 90 89 95 93 93 96/64/28 62 63 65 65/22 48 46/43 3 36/30/
GRABS	(9) 99/98 98 98/93 92/94/93 98/84 81 94 93 91 91 91 89 93 91/74/33 72 73 75 76/ 9 40 43/60 10 37/24/
PV16	(21) 99 99 99/95 92/92/93 98/83 80 93 94 92 9x 90 88 93 90/72/35 71 72 74 77/14 41 41/67 25 31/30/
GVI	(10) 99/99/96 95/92/89 93/86 82 96 95 94 93 93 91 95 94/68/32 65 66 60 72/24 40 44/63 16 39/33/
SQVI	(30) 99/97 94/92/90 93/83 81 96 94 93 92 92 90 94 93/66/35 66 68 69 74/24 46 42/66 19 36/30/
HGVI	(13) 96 96/93/91 95/94 80 96 94 92 91 92 90 94 93/65/35 68 69 70 74/22 43 41/62 14 40/37/
R64	(24) 95/99/90 90/75 71 93 89 87 86 83 83 89 87/51/40 68 69 70 79/29 37 23/74 22 30/35/
R74	(26) 93/84 85/73 71 92 88 85 84 91 89 89 92/46/41 62 63 65 69/31 42 31/50 6 36/31/
CH7	(5) 94 91/66 63 84 81 77 76 83 81 81 85/53/47 82 83 84 82/ 2 19 22/46 3 32/32/
CH6	(4) 96/63 50 81 77 75 74 72 70 77 74/60/33 91 92 92 94/13 6 12/69 20 21/32/
SVVI	(33) 80 75 89 88 87 86 82 81 88 83/77/37 80 81 82 82/ 3 20 36/60 32 22/20/
CLAI	(6) 96/87 94 95 94 94 97 92 89/83/11 31 33 34 37/35 73 79/49 24 23/ 3/
GLAI	(20) 90 93 95 95 91 91 92 89/80/11 24 27 28 30/37 77 83/42 18 33/ 3/
GVBB	(11) 99 98 98/96 96/96 94/60/20 53 54 56 60/34 59 59/60 17 40/33/
LAI	(12) 99 99/97 96/96 94/73/17 48 49 50 54/34 65 61/57 18 38/24/
ND6	(17) 99/96 93/96 93/73/13 44 46 47 52/36 67 64/59 22 34/23/
TV16	(34) 93 93/93 91/76/19 44 45 47 51/36 66 63/59 20 33/23/
ND7	(18) 99/93 97/67/14 43 44 46 47/37 67 63/41 2 58/24/
TV17	(35) 92 94/67/15 41 43 44 46/36 66 62/39 2 58/22/
R65	(25) 97/73/13 47 49 50 55/35 64 63/57 17 37/28/
R75	(27) 66/13 46 47 49 50/35 63 62/41 3 56/26/
HYVI	(16) 13 41 42 42 36/11 49 72/38 39 8/38/
ELAI	(8) 66 65 66 71/18 43 62/46 13 4/35/
MSBI	(15) 99/99/96/47 32 17/54 23 11/21/

SSBI	(32) 99/96/46 31 16/55 23 11/21/	NAME NO	VARIABLE	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI		1	36			99 94
PV17		2	1			99 96
GRABS		29	12			99 51
PV16		21				99 66
GVI		10				99 89
HGVI						99 47
R64		52				91 37
CH4		44				91 88
CH7		46				93 01
CH6		48				93 48
SVVI		53				93 59
CLAI		56				93 72
GVBB		50				98 17
LAI		51				97 41
ND6		57				69 41
TV16		54				69 38
ND7		58				99 39
TV17		55				99 10
R65		59				95 71
HYVI		56				95 60
ELAI		51				95 94
MSBI		51				95 10
SNSI		53				95 79
CH4		55				95 93
CH5		56				95 00
R45		58				95 40
MNSI		59				78 93
NSI		60				78 78
R76		61				78 29
YVI		63				78 34

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Yolo County - February 28, 1978 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD			
NAME	NO		
AVI	(1) 99/97/97 96 98 98 97/92 93/95 94 96 92 91 93 93 92 94/00 93/00 01 02 01/66 93 61/13 38/20 30 40/24 63/		
PVI7	(23) 98/90 96 98 98 97/93 93/95 93 95 91 90 94 92 91 94/00 92/02 02 04 02/66 02 59/11 55/21 30 40/24 63/		
CH7	(9) 97 95 96 96 93/93 94/89 07 09 84 03 07 06 04 07/05 09/90 90 91 08/63 72 49/ 0 39/20 20 39/29 60/		
GRABS	(9) 99/99 90 98/77 98/95 92 93 91 91 91 90 91 90/07 08/07 08 09 08/75 82 60/ 3 50/20 25 51/ 6 48/		
PVI6	(21) 99 99 99/97 98/94 93 95 92 92 91 90 92 90/90 09/86 07 08 09/72 81 57/ 9 52/29 21 09/ 0 42/		
GV1	(10) 99/99/45 96/95 95 96 94 93 93 92 93 92/93 92/05 03 85 07/67 82 57/16 56/27 36 36/ 6 49/		
MGVI	(13) 99/96 96/94 95 96 93 92 93 92 93 92/93 93/84 84 85 08/66 00 55/16 34/29 38 55/ 0 30/		
SGVI	(30) 95 96/94 95 96 93 93 93 91 93 91/94 93/03 03 05 08/66 00 55/10 55/29 39 55/ 3 46/		
CH6	(4) 98/84 85 07 03 02 81 80 82 80/06 03/95 95 96 96/69 69 41/ 6 31/34 29 59/ 2 34/		
SYVI	(33) 92 88 91 08 87 06 05 07 84/04 81/91 91 92 91/79 79 58/ 5 43/19 19 57/ 5 36/		
CLAI	(6) 96 98 97 97 97 96/96 95/83 85/71 72 73 71/78 94 77/14 71/ 1 17 43/ 9 52/		
GVSD	(11) 99/99 99/98 98/95 92/92 92/67 68 69 73/62 08 43/33 72/23 40 34/ 7 22/		
LAI	(12) 99 99/98 98/93 94/89 99/70 71 72 71/70 91 68/24 71/16 01 30/ 0 33/		
ND6	(17) 99/90 98/95 95/87 87/64 65 66 69/70 92 71/29 76/12 30 55/ 2 48/		
TV16	(34) 97 98/94 92/87 86/64 64 66 69/69 92 70/29 73/13 30 55/ 1 48/		
ND7	(10) 99/95 96/06 90/63 64 66 66/66 92 72/29 74/10 20 41/18 62/		
TV17	(35) 93 93/85 88/63 63 65 66/65 91 70/29 73/12 29 41/17 62/		
R65	(25) 98/88 89/64 63 66 69/68 91 74/30 73/ 6 32 52/ 4 46/		
R75	(27) 86 91/63 64 65 66/65 90 73/29 74/ 4 31 38/22 61/		
R64	(24) 96/69 70 72 02/41 67 36/43 56/48 65 69/ 0 39/		
R74	(26) 68 68 70 76/39 70 42/42 59/41 60 50/24 60/		
M801	(15) 99/99/96/63 51 29/31 3/33 15 47/ 0 30/		
SS81	(32) 99/96/65 52 30/31 4/34 15 47/ 0 30/		
SD1	(29) 96/64 53 30/28 6/33 18 48/ 0 31/		
SNS1	(31) 54 50 21/ 8 11/51 39 67/11 22/		
MYVI	(16) 81 81/36 42/36 38 28/18 17/		
 OLAI (20) 92/13 80/23 0 32/ 5 47/ VARIABLE NAME NO. OTHER BOUNDARY OF CLUSTER NUMBER OF ITEMS IN CLUSTER DISTANCE OR SIMILARITY WHEN CLUSTER FORMED			
R43	(23) 0 75/59 32 4/ 8 40/ AVI 1 29		58 53
CH4	(21) 62/33 78 34/ 3 13/ PVI7 23		97 99
CH5	(31) 22 22 23/ 7 41/ GRABS 30		99 17
ELAI	(8) 81 81/32/ 5 0/ GV1 30		99 35
YVI	(36) 59/ 0 12/ PVI6 30		99 34
MNS1	(14) 68 34/ ND7 34		99 47
NS1	(19) 88/ R65 35		97 34
R76	(28) / R63 27		98 24
			91 35
			88 07
			94 25
			99 29
			99 35
			81 03
			92 03
			65 13
			65 30
			80 07
			80 24
			86 74

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Yolo County - March 27, 1978 - Area

.000 PRINTED OVER ABSOLUTE CORRELATION MATRIX .CLUSTERING BY AVERAGE DISTANCE METHOD NAME NO		VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI	PVI7				
1 11 99/90 97 99 90 99/98 90 98 90 97 97 99/95 97/94 95 96/84 93 95/83 84/84/73 86/62 8 30 32 36 47 1 93/					
PVI7 1 221/90 97 99 90 99/98 90 98 90 97 96 96 95 98/93 95 96/86 93 96/82 83/84/70 84/62 8 33 36 40 50 2 53/					
GRABS 1 91 99/99 99 99/97 96 96 97 96 93 93/96 93/93 95 94/92 98 97/88 82/74/62 79/72 7 45 47 31 61/ 3 48/					
PVI6 1 211/99 99 99/97 95 97 97 96 96 93/97 95/92 95 94/92 98 96/87 81/72/64 79/75 11 44 46 50 61/ 6 51/					
GVI 1 101 99/99/98 97 90 98 97 97 96/97 97/93 95 95/88 96 95/85 82/77/70 82/72 4 36 39 43 55/ 6 55/					
SGVI 1 301/99/77 97 98 90 97 97 93/98 97/93 95 94/89 96 95/83 81/76/69 82/73 6 38 40 44 56/ 8 56/					
MVVI 1 131/98 97 98 90 97 97 93/97 97/93 93 93/89 96 96/84 81/77/69 82/72 3 30 41 45 56/ 7 56/					
CLAI 1 61 99/98 99 99 98/97/93 95/97 97 96/82 93 91/89 90/80/72 89/63 0 24 29 32 43/ 8 43/					
ND7 1 181/99 99 99 98/80/94 96/97 96 96/79 90 90/84 88/83/77 90/60 8 21 24 28 39/ 3 51/					
GVBB 1 111 99/99 99/98/93 96/93 95 94/81 91 91/84 85/81/77 89/67 0 24 27 31 44/ 2 55/					
LAI 1 121/99 99/98/94 93/96 93 94/81 92 91/85 86/81/76 89/65 1 24 27 31 43/ 0 32/					
ND6 1 171 99/98/94 94/97 95 94/80 91 89/86 88/79/77 90/67 2 22 24 28 41/ 2 50/					
TVI6 1 341/99/93 93/96 93 93/77 90 88/86 86/79/77 90/66 1 20 23 27 39/ 1 50/					
TVI7 1 331/91 93/93 91 92/73 87 88/82 85/86/79 91/59 8 14 19 23 33/ 0 51/					
R64 1 241 98/80 93 93/80 93 93/76 74/72/71 78/77 7 38 41 43 59/17 67/					
R74 1 261/89 94 95/84 90 95/74 77/83/73 81/64 17 33 33 39 52/12 65/					
GLAI 1 201 97 96/73 88 85/90 96/76/71 89/68 0 18 21 24 34/25 35/					
R47 1 271/81 90 91/83 91/79/68 83/58 7 28 31 73 44/19 46/					
CH6 1 41 96/94/78 62/54/33 49/79 25 73 76 79 86/19 44/					
SYVI 1 331/95/89 78/63/49 68/78 21 37 39 63 71/ 3 41/					
CH7 1 51/79 73/77/51 66/64 3 57 59 62 69/12 50/					
MYVI 1 161 89/55/44 73/61 25 35 38 40 44/30 7/					
R45 1 231/69/62 85/42 3 8 11 14 19/49 14/					
R76 1 281/71 78/17 36 3 3 9 15/ 0 46/					
CH4 1 21 92/41 21 34 32 28 8/ 7 69/					
CH5 1 31/44 14 19 16 12 1/16 46/	NAME NO	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI 1 17		1	36		28 79
GRABS 1 25					99 93
PVI6 1 21					99 46
GVI 1 10					99 81
SGVI 1 30					99 95
MVVI 1 13					99 98
CLAI 1 6					98 61
ND6 1 6					98 71
GVBB 1 6					99 27
LAI 1 13					99 68
ND7 1 17					99 83
TVI6 1 34					99 16
TVI7 1 35					97 35
R54 1 24					98 19
R44 1 24					95 80
GLAI 1 27					76 69
R63 1 20					99 26
R73 1 27					94 26
CH6 1 4					95 64
SYVI 1 3					96 85
CH7 1 3					95 82
MYVI 1 3					83 97
R76 1 30					73 14
CH4 1 7					74 60
CH5 1 24					42 50
MNSI 1 14					25 90
MSD1 1 55					99 96
SNSI 1 29					99 81
ELAI 1 65					37 07
YYVI 1 36					28 19

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Yolo County - May 2, 1978 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

VARIABLE
NAME NO.

AVI	(1) 99/99/99/98 98 98 90/96 96 98 90 97/95 94 96/92 96/92/80 91/70 87/84/72 78/52 35/43 14 23 20 16 0/
PVI7	(22) 99/90/90 98 97 97 90/97 96 98 98 97/95 94 96/92 96/93/70 89/72 88/84/72 77/53 35/44 14 20 17 13 2/
N07	(18) 90/90 90 90 90/95 94 97 97 96/97 96 98/92 96/49/82 93/66 83/84/73 82/47 34/42 14 29 26 22 6/
TV17	(33) 98 98 97 98 97/95 94 97 97 96/95 93 95/90 94/89/81 92/67 89/84/72 78/52 34/43 13 27 24 20 4/
CLAI	(6) 90 99 99/99/97 97 98 97 97/98 97 97/90 93/89/76 92/71 40/78/81 83/44 26/47 3 23 20 16 1/
CVSB	(11) 99 99/99/97 97 99 99 99/96 96 96/95 96/89/82 92/72 89/77/73 78/53 39/54 2 24 21 16 2/
N06	(17) 99/99/97 97 98 98 98/98 97 96/93 93/67/80 92/71 90/73/70 82/49 33/54 1 24 21 17 0/
TV16	(34) 98/97 97 98 98 98/98 96 96/93 93/88/80 92/71 90/75/77 81/51 33/54 0 24 21 17 0/
LAI	(12) 97 97 90 90 98/97 96 96/93 93/90/80 91/71 89/75 80/51 35/50 3 23 20 16 1/
GRAB5	(9) 99/98 98 98/95 94 93/92 91/94/67 83/83 96/71/81 78/51 26/57 7 4 1 2 17/
PVI6	(21) 99 99 99/94 94 92/94 91/92/70 84/84 96/68/79 73/36 32/63 11 3 2 2 19/
CVI	(10) 99/99/95 95 95/95 93/92/78 80/78 92/73/74 76/57 30/50 1 13 12 7 11/
MGVI	(13) 99/94 95 95/96 96/93/77 87/79 92/75/73 74/59 40/50 0 13 10 3 13/
SVVI	(30) 94 93 94/96 93/92/78 87/79 93/73/73 74/60 41/61 4 13 10 3 14/
DLAI	(20) 97 96/87 88/83/73 93/66 88/73/84 91/53 19/46 0 28 25 21 7/
R63	(25) 98/92 91/83/78 90/68 88/69/77 66/39 30/54 4 25 22 18 0/
R75	(27) 90 94/86/80 92/43 83/80/72 83/39 32/41 13 30 27 23 8/
R64	(24) 96/87/82 82/76 85/67/57 60/71 59/69 5 14 11 6 19/
R74	(26) 90/85 86/67 80/84/53 65/64 55/48 19 24 21 16 4/
CH7	(5) 98 69/82 90/78/63 61/60 34/46 11 11 14 19 31/
CH4	(2) 90/29 31/72/34 55/56 65/59 23 64 62 58 31/
CH5	(3) 41 70/77/69 84/34 30/33 15 58 55 51 35/
CH6	(4) 92/37/64 43/59 25/72 75 48 51 55 68/
SYVI	(33) 54/83 72/47 16/66 27 15 18 22 35/
R76	(28) 41 60/40 33/ 3 63 37 35 32 25/
HYVI	(16) 89/ 1 29/37 28 3 0 1 0/

R45	(23) 7 17/19 1 36 33 32 30/	VARIABLE NAME NO.	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
ELAI	(8) 83/64 3 12 13 17 16/	AVI	1	31	99 96
YVI	(36) 30 12 16 16 12 20/	PVI7	2		99 91
MNSI	(14) 71/24 26 30 58/	N07	3		99 79
MSBI	(19) 43 47 43 52/	CLAI	4		99 69
BSBI	(32) 99/	CVSB	11		99 69
SBI	(29) 93/	ND6	17		99 69
SNSI	(31) /	TV16	34		99 69
		GRAB5	15	5	99 69
		PVI6	21	9	99 69
		CVI	10	9	99 69
		MGVI	10	9	99 69
		SVVI	35	1	99 69
		DLAI	1	7	99 69
		R63	1	7	99 69
		R75	1	7	99 69
		R64	1	6	99 69
		R74	1	6	99 69
		CH7	1	6	99 69
		CH4	1	6	99 69
		CH5	1	6	99 69
		CH6	1	6	99 69
		SYVI	1	3	99 69
		R76	1	3	99 69
		HYVI	1	2	99 69
		PVI6	1	2	99 69
		YVI	1	2	99 69
		MNSI	1	1	99 69
		MSBI	1	1	99 69
		BSBI	1	1	99 69
		SBI	1	1	99 69
		SNSI	1	1	99 69

OF POOR

Yolo County - May 11, 1978 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD
NAME NO

AVI	(1) 99/99/90 98 97 97 96 97 96 98 98 98/97/93 97/92 92 93/88/76 71/64 83 78 51/46/40 86/ 2 0 3 16 39 49/
PV17	(22) 98/90 98 96 97 94/97 97 90 90 99/97/94 97/90 91 94/89/73 67/69 87 81 54/47/42 86/ 4 6 10 22 33 44/
ND7	(18) 99 98 90 98 97/96 95 97 96 96/96/93 96/94 93 97/86/79 76/38 78 74 46/44/36 83/ 9 7 3 9 43 51/
CLAI	(6) 98 99 99/98/97 97 98 97 97/95/92 94/94 96 96/90/73 73/62 79 73 43/49/27 70/ 3 3 0 12 30 38/
QV98	(11) 99 99/97/97 98 99 99 98/97/46 97/42 94 93/90/77 72/63 81 81 53/58/28 77/ 1 0 3 18 40 48/
ND6	(17) 99/99/97 97 98 97 97/95/93 94/94 96 96/90/77 76/61 76 75 43/55/21 75/ 7 6 2 11 30 37/
TV16	(34) 98/97 98 98 90 97/96/94 94/92 93 93/90/76 74/63 78 78 47/56/53 76/ 4 2 0 14 47 53/
DLAI	(20) 95 95 96 95 94/93/89 90/93 97 96/89/73 78/57 73 68 36/49/19 73/11 9 6 6 37 64/
GRAB8	(9) 99/98 98 98/93/93 93/89 92 92/96/64 62/76 87 79 48/56/25 76/13 15 18 30 43 47/
PV16	(21) 99 99 99/95/95 94/89 92 91/95/67 62/75 86 82 53/62/21 73/11 13 17 30 40 44/
QVI	(10) 99/99/96/96 96 96/91 93 93/92/73 60/70 83 82 56/59/28 78/ 4 5 9 24 38 44/
SGVI	(30) 99/96/97 97/90 92 92/92/74 65/72 86 85 59/62/27 77/ 7 8 12 28 34 41/
MGVI	(13) 96/97 97/89 91 92/92/72 63/74 88 83 60/60/51 80/ 9 11 15 30 32 39/
TV17	(35) 92 94/85 87 90/87/72 65/67 63 63 53/49/40 86/ 4 5 9 22 33 41/
R64	(24) 97/86 89 89/87/75 59/73 84 88 70/69/26 74/10 11 13 33 21 29/
R74	(36) 88 89 92/84/70 64/67 83 83 66/54/43 85/ 3 5 9 23 22 34/
LAI	(12) 95 95/91/77 80/47 66 60 54/42/23 70/19 17 14 2 54 64/
R65	(25) 98/89/76 80/51 67 61 34/49/15 67/16 15 11 0 58 68/
R75	(27) 82/78 80/50 70 63 37/40/29 76/17 15 11 0 32 63/
SYVI	(33) 43 46/84 87 76 41/63/ 9 61/30 32 33 44 44 41/
CH4	(2) 87/14 38 57 51/40/26 65/52 51 47 26 26 43/
CH3	(3) 2 22 28 6/17/11 53/69 68 65 53 68 79/
CH6	(4) 72/81 63/66/18 49/73 74 77 84 4 9/
CH7	(5) 88 67/51/48 78/51 32 35 65 2 6/
ELAI	(8) 86/70/35 71/36 36 40 38 12 10/
YVI	(36) 66/38 33/34 34 38 39 32 42/

		VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
MNS1	(14) 35 10/31 32 54 54 1 8	AVI	1	20	37 34
NS1	(19) 79/ 6 6 8 8 30 9	PV17	20	1	49 76
R76	(28) 0 1 4 10 9 26	ND7	20	1	48 63
M901	(15) 99/99/95/44 55	CLAI	20	1	49 64
SG01	(32) 99/95/42 54	QV98	11	1	49 77
S01	(29) 96/43 54	ND6	17	1	49 77
SNG1	(31) 47 56	TV16	34	6	49 82
HYVI	(16) 93	DLAI	20	1	49 57
R45	(23)	GRAB8	27	1	49 91
		PV16	20	1	49 57
		QV98	20	1	49 66
		SGVI	10	1	49 66
		MGVI	10	1	49 66
		TV17	20	1	49 66
		R64	20	1	49 66
		R74	20	1	49 66
		LAI	27	1	49 66
		R65	27	1	49 66
		R75	27	1	49 66
		SYVI	3	1	49 66
		CH4	3	1	49 66
		CH3	36	1	49 66
		CH6	36	1	49 66
		CH7	36	1	49 66
		ELAI	36	1	49 66
		YVI	36	1	49 66
		MNS1	14	1	50 39
		NS1	14	1	50 39
		R74	28	1	50 39
		R65	28	1	50 39
		SG01	15	1	50 39
		S01	29	1	50 39
		SNG1	15	1	50 39
		HYVI	27	1	50 39
		R45	19	1	50 39

**CLUSTERING
OF POOR QUALITY**

Yolo County - May 12, 1978 - Area

ITEMS PRINTED OVER ABSOLUTE CORRELATION MATRIX						
CLUSTERING BY AVERAGE DISTANCE METHOD						
NAME	VARIABLE NO					
AVI	(1) 99/90/97 96 98 98 90/90 97 97 98 99 93/93 97/94 93 95/07/64 05/77 73/77 50 41/43 85/ 2 0 0 0 15 41 52/					
PVI7	(22) 98/97 97 98 90 90 96 97 98 90 94 94 97/93 91 94/08/69 08/74 69/00 33 42/43 85/ 3 0 0 9 21 37 47/					
TV17	(35) 95 95 97 97 97/97 96 97 98 90 74/93 96/90 90 90/86/65 85/76 71/80 32 41/44 86/ 0 1 4 17 37 48/					
GRABB	(9) 91 99/96 98 98 98 97 97 95 95/94 93/92 92 92/96/76 88/64 64/78 46 53/27 74/13 15 18 29 46 50/					
PVI6	(21) 99 99 99/97 97 97 98 95 95/95 94/92 93 92/94/76 07/67 64/80 50 59/23 71/12 14 17 30 43 47/					
ZVI	(10) 99/99/98 98 98 99 97 95/96 96/94 94 94/91/71 86/75 70/81 54 54/31 77/ 4 5 9 23 40 48/					
SGVI	(30) 94/97 97 98 99 96 94/97 96/93 92 93/92/73 87/74 67/83 57 58/30 76/ 7 9 13 27 37 44/					
MVVI	(13) 97 97 97 98 96 94/97 97/92 92 92/92/73 89/73 65/84 58 56/34 70/ 9 11 15 29 35 42/					
CLAI	(6) 99 99/99/99 99/92 94/93 94/97/90/83 81/70 77/72 41 43/31 78/ 3 3 0 11 32 60/					
ND6	(17) 99/99/98/99/93 93/95 97 97/90/61 78/77 78/72 42 50/23 74/ 8 6 4 10 33 61/					
TV16	(34) 99/90/98/93 94/94 96 96/90/64 00/77 77/74 44 51/26 75/ 3 3 0 13 30 38/					
DVBD	(11) 98/97/98 96/94 95 96/89/68 83/78 74/78 51 51/32 78/ 2 0 0 17 43 52/					
ND7	(18) 97/92 96/93 96 98/85/58 00/79 79/72 45 39/40 83/10 8 4 7 47 39/					
CLAI	(20) 08 89/94 98 97/08/56 73/75 81/64 33 44/22 72/13 11 7 3 60 69/					
R64	(24) 97/89 89 89/87/73 87/74 60/88 67 66/29 72/12 13 18 35 23 31/					
R74	(26) 90 89 92/03/68 07/70 65/05 66 48/47 05/ 4 5 9 23 23 36/					
LAI	(12) 95 95/03/54 73/77 79/64 39 42/29 73/13 12 8 3 31 62/					
R65	(25) 98/89/55 67/76 82/59 32 46/18 67/16 14 11 0 60 70/					
R75	(27) 82/51 79/70 82/61 36 33/34 77/17 15 12 0 54 69/					
SYVI	(33) 85 86/45 48/73 38 62/ 8 56/30 32 33 43 48 43/					
CH6	(4) 91/13 1/82 60 66/16 43/72 73 76 83 1 3/					
CH7	(5) 42 28/08 66 48/48 77/48 49 33 61 6 11/					
CH4	(2) 87/57 52 33/35 68/51 50 46 26 24 43/					
CH5	(3) 28 7 13/18 57/67 65 63 51 66 81/					
ELAI	(8) 06/66/38 68/37 38 42 59 13 7/					
VVI	(36) 60/42 53/32 32 36 57 52 40/					
MNSI	(14) 38 1/34 35 38 56 2 6/	NAME	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
NSI	(19) 82/ 0 0 2 3 29 6/	PVI7	22	1	3	99 73
R76	(20) / 3 4 0 7 9 29/	TV17	35	1	3	99 78
MSOI	(15) 99/99/95/39 54/	GRABB	9	13	98 91	
SSOI	(32) 99/95/37 53/	PVI6	21	9	98 89	
SOI	(29) 96/37 52/	ZVI	10	13	98 85	
SNSI	(31) /42 54/	SGVI	13	1	99 86	
MYVI	(16) 93/	MVVI	13	1	97 38	
R45	(23) /	CLAI	6	20	97 38	
		ND6	17	34	98 41	
		TV16	34	6	98 86	
		QVVI	11	6	99 48	
		ND7	18	6	98 81	
		OLAI	20	1	97 33	
		R64	24	26	97 33	
		R74	26	1	99 43	
		LAI	27	1	93 89	
		R65	27	1	93 89	
		SYVI	27	1	88 89	
		CH6	34	3	71 49	
		CH7	35	3	74 74	
		CH4	35	3	82 34	
		CH5	35	3	88 23	
		EVI	36	14	88 65	
		VVI	36	8	88 65	
		MNSI	14	28	56 65	
		NSI	14	28	62 78	
		R76	20	20	51 37	
		MSOI	20	20	44 34	
		SSOI	20	15	99 86	
		SOI	21	15	93 94	
		SNSI	21	15	93 94	
		MYVI	21	20	27 73	

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OF POOR QUALITY

Yolo County - May 20, 1978 - Area

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

VARIABLE NO

AVI	(1) 99/99/99/98 96 96 93 95/95 93 97 97 93 93/93/03/71 81 07/07/69/24 01/65 49 52 8 39 66 14 13 11 7 14/
ND7	(10) 99/99/97 96 96 93 93/96 94 97 97 96 93/94/04/72 83 91/04/60/20 01/62 46 50 11 43 49 10 8 6 2 19/
PV17	(22) 98/96 93 93 93 93/96 94 97 97 96 93/84/76 84 93/81/60/26 04/57 42 44 15 48 73 4 3 1 2 20/
R75	(27) 98 96 96 96 97/94 93 96 96 94 94/91/82/66 80 87/87/65/20 78/66 51 56 5 38 64 15 14 12 8 16/
CLAI	(6) 98 98 98 98/96 73 76 97 74 94/09/06/63 77 02/07/63/7 69/71 61 62 3 35 58 20 18 17 13 19/
ND6	(17) 99/99 99/97 97 90 90 93 96/07/08/67 82 83/85/65/1 64/60 50 50 3 40 58 16 14 13 7 32/
TV16	(34) 99 98/97 97 98 98 96 97/90/89/71 83 84/84/65/1 63/66 57 55 4 42 60 14 12 10 3 33/
OLAI	(20) 99/93 94 93 96 92 93/06/86/62 76 70/06/64/2 62/72 63 65 3 34 53 21 20 18 14 23/
R69	(20) 94 94 93 96 92 93/03/03/62 78 00/00/66/2 61/71 62 63 2 34 53 21 20 18 13 27/
GRABD	(9) 99/90 97 97 97/92/93/76 82 07/79/49/4 70/52 49 46 10 57 73 4 6 7 10 35/
PV16	(21) 90 90 90 90/91/92/81 90 89/77/53/3 66/50 45 41 17 59 73 6 7 9 15 45/
QVI	(10) 99/99 99/93/90/80 90 91/81/63/7 72/57 44 43 19 52 70 3 1 0 6 38/
GV90	(11) 99 99/93/99/79 97 91/01/63/7 72/58 44 44 18 31 70 4 3 0 5 37/
MGVI	(13) 99/94/90/03 93 94/76/58/11 73/48 34 33 28 60 77 6 8 10 16 42/
SV01	(30) 99/90/04 93 93/70/61/5 71/51 37 36 24 37 74 3 4 6 13 43/
TV17	(35) 99/92/02 86 93/66/51/20 85/51 29 30 26 58 80 9 10 12 16 27/
SYVI	(33) 73 82 78/69/26/14 55/33 44 36 10 71 73 24 26 27 28 47/
ELAI	(8) 95 90/41/39/12 66/8 10 16 66 79 83 40 40 43 53 65/
R64	(24) 99/99/51/7 67/24 4 2 37 73 82 27 28 30 41 64/
R74	(26) 64/53/34 86/30 7 10 49 66 87 20 21 23 31 39/
LAI	(12) 69/4 04/70 65 69 15 10 33 40 38 37 33 6/
CH4	(2) 8 40/81 36 44 10 19 6 64 63 61 48 12/
NGI	(19) 72/6 32 14 23 3 37 7 6 7 3 34/
R76	(28) 27 4 14 31 46 79 12 13 15 15 7/
CH5	(3) 81 06/46/38 12 62 81 80 77/18/
HYVI	(16) 96/77/27 16 61 60 60 66/21/

R45	(23) 76/36 16 69 68 69 74/35/	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI	1	14		33	33 47
ND7	10			33	99 33
PV17	17			33	99 47
R75	24			33	99 71
CLAI	16			33	99 80
ND6	15			33	99 90
OLAI	20			33	99 90
R69	23			33	99 23
TV16	34			33	99 07
GRABD	1	17		33	99 26
PV16	21			33	99 34
QVI	10			33	99 34
GV90	11			33	99 34
MGVI	13			33	99 74
SV01	30			33	99 74
TV17	35			33	99 79
SYVI	53			33	99 86
ELAI	8	26		33	99 86
R64	24			33	99 86
R74	26			33	99 86
LAI	12			33	99 86
CH4	2			33	99 86
NGI	19			33	99 86
R76	28			33	99 86
CH5	3			33	99 86
HYVI	16			33	99 86
R45	23			33	99 86
AVI	1			33	99 86
CH6	24			33	99 86
CH7	23			33	99 86
MS01	15			33	99 86
SS01	20			33	99 86
SG01	29			33	99 86
SNS1	31			33	99 86
MNS1	14	1		33	99 86

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Yolo County - May 29, 1978 - Area

**TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD
VARIABLE**

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Yolo County - June 16, 1978 - Area

**ORIGINAL PAGE IS
OF POOR QUALITY**

Yolo County - All Dates Combined - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERED BY AVERAGE DISTANCE METHOD									
NAME	NO	VARIABLE	OTHER BOUNDARY	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED				
AVI	1	97 95 93 97/76 03/76 92 91 91 92 00 94 91 86 85 85 87 79/03/97 23 33/92 39 38 37 38 64 13 0 38 16/17		35	10 65				
QVI	101	99/98/97/03 92/97 92 92 92 90 00 93 09 86 03 89 04 79/06/96 42 49/39 24 25 23 23 23 2 12 84 24/23		20	97 67				
QVVI	301	99/97/00 94/96 92 91 91 00 07 91 09 05 02 90 06 73/04/60 44 37/35 80 19 19 10 40 7 17 53 27/22		10	99 70				
MVVI	131	90/93 97/94 90 00 09 86 04 00 07 02 00 91 06 67/79/97 07 07/24 9 8 8 7 38 10 20 66 34/23		10	97 23				
PV17	221	97/94 90 00 00 00 04 09 87 02 81 80 00 69/78/43 24 31/31 17 16 17 16 45 9 23 97 29/23		10	97 23				
GRAD0	91	98/79 73 70 72 65 6 67 70 64 60 76 70 44/69/63 43 17/12 23 26 26 27 3 31 99 07 46/42		10	99 46				
PV16	811	06 01 00 00 74 75 77 77 73 69 05 76 33/77/60 50 20 3 10 1 11 12 19 38 45 81 40/37		10	97 16				
CLAI	61	90 90 90 90/76 76/76/73/72 91/91 99/03/83/50 37 3/46 02 01 02 30 50 3 4 43 16/18		10	99 16				
QV00	111	99 99/90 97/93/97/94 93/94 93/04/7/51 00 49/47 03 02 03 01 57 8 2 37 19		10	99 19				
ND6	171	99/90 90/96/66/94 93/92 91/03/70/51 07 46/51 08 07 07 35 61 12 3 36 13 8		10	99 13				
TV16	341	97/93/96/92 90/91 90/03/70/52 07 43/49 36 05 05 03 59 10 1 38 18 7		10	97 18				
ND7	101	98/96/96/95 96/91 94/90/73/40 24 59/53 42 41 42 40 64 10 6 29 3 0		10	99 0				
DLAI	201	93/93/96 93/09 09/12/73/40 36 43/52 09 30 39 07 41 15 5 32 2 7		10	99 2				
LAI	121	90/94 93/00 08/90/02/46 36 47/50 46 45 45 44 60 21 10 30 2 11		10	99 11				
TV17	331	07 07/00 91/00/70/40 22 60/46 03 02 02 30 55 8 0 37 22		10	99 22				
R65	251	90/91 91/92/71/40 33 44/51 08 07 37 35 59 14 5 31 3		10	99 3				
R73	271	90 93/91/63/37 22 04/53 40 39 40 30 60 18 6 23 6		10	99 6				
R64	241	96/70/62/61 32 40/29 13 12 13 9 38 11 21 02 32		10	99 21				
R74	261	73/56/40 11 61/37 23 22 22 20 43 0 14 39 23/11		10	99 11				
R45	231	73/51 03 49/68 60 60 60 59 76 40 03 6 34/10		10	99 10				
MYVI	161	40 62 13/45 09 38 08 09 62 19 11 40 0/58		10	99 40				
MN01	141	03/32/5 16 17 17 21 2 36 20 63 01/11		10	99 11				
ND1	191	54/ 5 2 2 2 0 17 12 1 43 4/44		10	99 44				
R76	201	45 30 07 38 00 44 30 10 13 3/27		10	99 27				
CH4	21	90 90 90 97/97/90 03/54/30/23		10	99 23				
M001	151	99 99/99/75/93 91/65/47/14		10	99 14				
DD1	291	99/99/99/96 91/65/47/19 NAME NO VARIABLE OTHER BOUNDARY NUMBER OF ITEMS IN CLUSTER DISTANCE OR SIMILARITY WHEN CLUSTER FORMED	35	10 65					
DD01	321	99/95/96 91/65/47/19 AVI 1 35 97 67		10	99 67				
DD01	321	99/95/96 91/65/47/19 QVI 2 35 99 70		10	99 70				
DD01	321	99/95/96 91/65/47/19 MVVI 3 35 99 00		10	99 00				
DD01	321	99/95/96 91/65/47/19 PVI7 4 35 98 14		10	98 14				
DD01	321	99/95/96 91/65/47/19 GRAD0 5 35 98 46		10	98 46				
CH5	31/03	76/59/35/6/ AVI 6 35 99 11		10	99 11				
CH5	31/03	76/59/35/6/ QV00 7 35 99 56		10	99 56				
CH6	41	97/83/56/27/ TV16 8 34 97 21		10	97 21				
CH6	41	97/83/56/27/ ND7 9 34 98 03		10	98 03				
CH7	51/04/59/23/ DLAI 10 35 97 29		10	97 29					
CH7	51/04/59/23/ LAI 11 35 95 00		10	95 00					
CH7	51/04/59/23/ TV17 12 35 95 00		10	95 00					
CH7	51/04/59/23/ R63 13 35 95 00		10	95 00					
CH7	51/04/59/23/ R73 14 35 95 00		10	95 00					
CH7	51/04/59/23/ R64 15 35 95 00		10	95 00					
CH7	51/04/59/23/ R45 16 35 95 00		10	95 00					
CH7	51/04/59/23/ MYVI 17 35 95 14		10	95 14					
CH7	51/04/59/23/ MN01 18 35 95 14		10	95 14					
CH7	51/04/59/23/ ND1 19 35 95 00		10	95 00					
CH7	51/04/59/23/ R76 20 35 95 00		10	95 00					
CH7	51/04/59/23/ CH4 21 35 95 00		10	95 00					
CH7	51/04/59/23/ CH5 22 35 95 00		10	95 00					
CH7	51/04/59/23/ CH6 23 35 95 00		10	95 00					
CH7	51/04/59/23/ CH7 24 35 95 00		10	95 00					
CH7	51/04/59/23/ CH8 25 35 95 00		10	95 00					
CH7	51/04/59/23/ CH9 26 35 95 00		10	95 00					
CH7	51/04/59/23/ CH10 27 35 95 00		10	95 00					
CH7	51/04/59/23/ CH11 28 35 95 00		10	95 00					
CH7	51/04/59/23/ CH12 29 35 95 00		10	95 00					
CH7	51/04/59/23/ CH13 30 35 95 00		10	95 00					
CH7	51/04/59/23/ CH14 31 35 95 00		10	95 00					
CH7	51/04/59/23/ CH15 32 35 95 00		10	95 00					
CH7	51/04/59/23/ CH16 33 35 95 00		10	95 00					
CH7	51/04/59/23/ CH17 34 35 95 00		10	95 00					
CH7	51/04/59/23/ CH18 35 35 95 00		10	95 00					
CH7	51/04/59/23/ CH19 36 35 95 00		10	95 00					

**DEFINITION
OF POOR QUALITY**

Yolo County - October 7, 1977 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE LINKAGE METHOD

NAME NO	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI	1	22 23	35	.22 .40
ND7	10	23	34	.91 .00
R75	27	10	33	.99 .99
PV17	32	10	32	.99 .87
TV17	33	10	31	.00 .20
CLAI	34	10	30	.00 .13
QVDD	35	10	29	.00 .14
ND6	36	10	28	.00 .13
TV16	37	10	27	.00 .14
R65	38	10	26	.00 .13
CLAI	39	10	25	.00 .13
PV16	40	10	24	.00 .13
QV1	41	10	23	.00 .13
QV1	42	10	22	.00 .13
HOV1	43	10	21	.00 .13
HOV1	44	10	20	.00 .13
ELAI	45	10	19	.00 .13
R64	46	10	18	.00 .13
R74	47	10	17	.00 .13
CH4	48	10	16	.00 .13
CH5	49	10	15	.00 .13
CH6	50	10	14	.00 .13
MHO1	51	10	13	.00 .13
BBG1	52	10	12	.00 .13
BBG1	53	10	11	.00 .13
HOV1	54	10	10	.00 .13
ELAI	55	10	9	.00 .13
BBG1	56	10	8	.00 .13
CH4	57	10	7	.00 .13
CH5	58	10	6	.00 .13
CH6	59	10	5	.00 .13
MHO1	60	10	4	.00 .13
BBG1	61	10	3	.00 .13
HOV1	62	10	2	.00 .13
CH7	63	10	1	.00 .13
GRAB6	64	10	0	.00 .13
QVVI	65	10	0	.00 .13
MHO1	66	10	0	.00 .13
ND1	67	10	0	.00 .13
R76	68	10	0	.00 .13
LAI	69	10	0	.00 .13
HYVI	70	10	0	.00 .13
YVI	71	10	0	.00 .13
R45	72	10	0	.00 .13

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OF POOR QUALITY

Yolo County - November 12, 1977 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

VARIABLE
NAME NO

	AVI	PVI7	ND7	R75	TV17	SYVI	VVI	R45	CH4	CH5	CH6	M501	S501	SBI	GNS1	CH7	ELAI	R64	MNS1	NS1	R76	CLAI	CVI	ND6	TV16	R65			
	1 11 94/78 78 69/42 29 65/53 71 51 59 50 59 61 35 39 37 48 44 60 4 1 2 1 3 4 9 2 26 47 20 26 1/10/	1 22/93 93 85/39 25 47/26 43 20 29 29 29 32 1 15 10 31 30 46 24 26 26 26 27 20 36 27 1 62 49 44 29/ 8/	1 18/99/92/33 19 30/ 0 14 7 0 0 0 3 27 6 13 13 14 29 42 48 47 47 47 43 55 45 25 67 61 53 30/ 3/	1 27/72/33 20 31/ 0 13 6 0 0 4 26 5 12 14 14 30 41 47 46 47 46 42 34 44 24 66 61 33 49/ 1/	1 35/23 11 19/ 4 5 15 7 8 6 5 33 16 22 3 7 22 44 52 50 51 49 46 56 49 30 67 64 56 55/10/	1 16/90/79/14 33 14 17 17 18 30 18 36 33 33 12 4 34 4 21 21 23 11 41 23 24 21 2 4 49/27/	1 36/179/21 27 22 18 17 19 35 18 52 53 59 15 23 5 21 6 6 14 10 6 8 16 31 33 59/26/	1 23/35 74 65 66 63 66 76 60 81 76 71 39 55 15 41 27 27 26 36 10 26 32 3 27 27 66/33/	1 21 87 83 91 91 90 81 84/33 55 38 53 57/48 52 52 53 52 53 65 53 63 0 18 11/31/19/	1 31 93 97 97 97 96/90/75 77 64 56 63/40 57 49 50 48 54 49 50 74 1 27 21/6/3/	1 41 90 90 90/90/94/84 89 76 74 75/67 80 75 75 77 75 77 91 35 56 51/65/29/	1 15/99/99/98/94/79 03 68 65 70/56 70 65 65 64 68 66 66 86 19 42 36/60/29/	1 32/99/90/94/78 83 68 66 70/56 70 65 65 64 60 67 66 86 19 42 36/59/29/	1 29/199/94/79 03 68 66 70/56 71 65 65 64 68 67 66 86 19 43 37/60/30/	1 31/192/86 90 79 70 75/56 73 66 66 66 70 62 67 83 25 49 44/66/32/	1 51/76 81 56 48 51/55 75 67 66 66 70 72 68 83 30 53 44 76/31/	1 81 95/04/60 76/67 83 75 75 74 82 89 71 71 46 66 53/76/34/	1 24/191/75 77/71 09 81 01 01 05 48 80 78 56 75 73/80/34/	1 14/107 86/64 74 70 69 71 72 53 73 67 92 66 70/55/25/	1 19/93/77 71 76 75 78 74 60 30 81 50 57 63/23/13/	1 29/1 81 63 69 60 69 71 54 67 74 32 43 48/29/20/	1 61 92 97 97 97 96/89 92/84/76 79 79/43/17/	1 11/97 98 97 98/89 95/86/79 89 06/7/27/	1 17/99/99/98/92 97/88/80 87 83/60/22/	1 34/199/98/92 96/88/79 06 84/61/24/	1 25/197/93 98/89/82 86 87/59/18/			
	1 20/1/87 92/66/74 83 82/65/27/	NAME NO	VARIABLE NAME NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED																							
OLAI	1 20/1/87 92/66/74 83 82/65/27/	AVI	1	12	32	17																							
GRABS	1 9/95/93/74 79 75/51/12/	PVI7	22	39	94	22																							
		ND7	18	18	93	19																							
		R75	27	18	94	18																							
		TV17	35	1	95	20																							
		SYVI	15	15	99	29																							
		VVI	26	15	90	22																							
		R45	21	15	90	22																							
		CH4	26	15	98	29																							
		CH5	26	15	98	29																							
		CH6	24	14	98	28																							
		M501	25	15	98	29																							
		S501	25	15	98	29																							
		SBI	25	15	98	29																							
		GNS1	25	15	98	29																							
		CH7	25	15	98	29																							
		ELAI	25	15	98	29																							
		CVI	10/ 96/96/54/ 6/	10/ 96/96/54/ 6/	100	99																							
		ND6	17/ 99/99/98/92 97/88/80 87 83/60/22/	17/ 99/99/98/92 97/88/80 87 83/60/22/	98	98																							
		TV16	1 34/199/98/92 96/88/79 06 84/61/24/	1 34/199/98/92 96/88/79 06 84/61/24/	98	98																							
		R65	1 25/197/93 98/89/82 86 87/59/18/	1 25/197/93 98/89/82 86 87/59/18/	98	98																							
		OLAI	20/ 91/83 89 88/59/13/	20/ 91/83 89 88/59/13/	98	98																							
		GRABS	9/ 95/93/74 79 75/51/12/	9/ 95/93/74 79 75/51/12/	98	98																							
		PVI6	1 21/91/83 89 88/59/13/	1 21/91/83 89 88/59/13/	98	98																							
		SYVI	1 33/53 65 62/49/18/	1 33/53 65 62/49/18/	98	98																							
		VVI	1 14/107 86/64 74 70 69 71 72 53 73 67 92 66 70/55/25/	1 14/107 86/64 74 70 69 71 72 53 73 67 92 66 70/55/25/	98	98																							
		MVVI	1 13/198/73/16/	1 13/198/73/16/	98	98																							
		SGVI	1 30/15/14/	1 30/15/14/	98	98																							
		R74	1 26/134/	1 26/134/	98	98																							
		LAI	1 12/	1 12/	98	98																							
		CLAI	GRABS	PVI6	SYVI	MVVI	SGVI	R74	LAI																				

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Yolo County - January 23, 1978 - Field

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Yolo County - February 28, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD

VARIABLE
NAME NO

AVI	(1) 99/97/97 90 96 94 97 97 96/95 93 93 92 90 93 93 91 93/94 91/72/61 82 69/73 76 77 73/26 23 34/26 14 20/
PV17	(22) 98/90 90 96 94 97 97 96/94 92 94 89 89 94 92 91 94/94 90/70/61 81 67/77 77 79 74/25 23 34/24 13 20/
CH7	(5) 92 89 94 92 94 93 93/97 84 87 80 80 86 84 83 88/80 87/55/56 71 57/63 85 87 80/22 27 54/13 5 20/
CH6	(4) 97/96 97 95 95 95/85 83 85 81 81 79 78 84 80/83 78/50/68 70 55/93 93 94 94/93 10 19/ 7 2 19/
BYVI	(33) 98 98 95 95 95/92 87 70 88 87 84 83 89 84/80 74/62/61 82 69/87 88 88 86/53 16 16/ 5 20/ 5/
GRADS	(9) 99/98 90 98/95 92 95 91 91 91 90 92 91/84 83/68/74 84 71/83 84 85 82/43 0 33/15 17 12/
PV16	(21) 99 98 99/94 93 95 92 92 90 90 93 89/80 84/69/72 82 67/82 83 84 85/92 8 25/21 12 19/
QVI	(10) 99/99/95 95 96 94 93 93 92 94 92/91 89/72/66 82 66/79 80 81 82/47 0 34/29 8 23/
MQVI	(13) 99/94 95 96 92 92 93 92 92/71 90/71/64 80 80 84/80 82 83/46 3 37/27 5 20/
BQVI	(30) 94 95 96 93 93 92 91 93 91/72 89/71/65 80 84/79 80 81 84/51 2 31/31 5 29/
CLAT	(6) 93 98 97 97 97 96/96 93/79 80/84/79 94 84/66 67 68 64/34 3 39/22 34 3/
QVOC	(11) 99/90 90/90 90/95 94/90 90/97/61 87 71/59 60 62 66/46 1 30/47 11 29/
LAI	(12) 99 99/98 98/93 94/86 86/86/69 90 76/64 65 66 67/41 2 39/36 20 18/
ND6	(17) 99/97 98/96 92/95 83/90/71 92 78/57 50 60 62/46 3 31/39 24 17/
TV16	(34) 97 98/94 91/84 82/90/70 91 78/56 57 59 61/46 6 31/40 23 17/
ND7	(10) 99/95 97/84 88/89/64 91 79/56 57 59 58/50 13 47/40 24 18/
TV17	(35) 93 94/93 86/70/64 90 77/54 55 57 57/31 11 48/41 23 18/
R63	(25) 97/86 84/84/69 92 89/62 63 64 66/44 2 32/35 28 17/
R75	(27) 83 80/83/61 90 79/60 61 62 60/26 19 31/30 27 18/
R64	(24) 97/67/36 62 40/63 63 66 79/62 4 26/39 23 61/
R74	(26) 69/29 63 44/29 60 62 69/34 26 34/37 18 36/
CH5	(31) 57 87 79/18 19 21 23 29 0 35/35 35 12/
HYVI	(16) 83 86/60 61 60 48/31 31 3/29 47 49/
OLAI	(20) 96/49 50 51 44/26 2 31/16 58 15/
R45	(23) 38 39 39 26/ 9 1 28/ 2 77 39/
MSBI	(15) 99/99/93/39 5 14/22 0 6/

SSBI	NAME NO	VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
SSBI	(32) 99/93/39 5 14/21 0 5	AVI	1	35	23 80
SBI	(29) 94/41 4 15/18 1 9/	PV17	29	1	99 93
CH7		CH7	1	1	97 84
CH6		CH6	4	30	99 94
SNSI	(31) 64 20 1/ 6 23 35/	GRADS	3	4	98 99
MNSI	(14) 72 57/35 29 44/	PV16	21	30	99 95
NSI	(19) 91/ 5 1 5/	QVI	10	30	99 95
R76	(20) 21 8 11/	MQVI	13	10	99 91
CH4	(2) 44 81/	CLAT	6	27	94 15
ELAI	(8) 62/	ND6	11	27	93 200
YVI	(36) /	TV16	34	11	99 16
		ND7	18	35	98 96
		TV17	25	16	99 57
		R65	25	17	97 52
		R75	24	17	97 50
		R64	24	16	90 70
		R74	26	16	94 90
		CH5	26	1	85 730
		HYVI	15	1	83 80
		OLAI	16	3	83 24
		R45	15	1	96 21
		MSBI	15	1	74 20
		SSBI	15	1	94 04
		SBI	15	1	94 40
		MNSI	14	1	99 23
		NSI	19	20	67 17
		R75	28	1	68 17
		CH4	28	1	91 89
		ELAI	30	1	87 43
		YVI	36	1	85 66

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Yolo County - March 27, 1978 - Field

TABLE PRINTED OVER ABSOLUTE CORRELATION MATRIX
CLUSTERING BY AVERAGE DISTANCE METHOD
VARIABLES

NAME	NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
AVI	1	1	99/97/97	95	97	97	96/97	96	98	95	94	97	96	94	96/90	95/88	91/80	0	76	75/69	70	72	68/43	6	64/47	25	27	
PV17	2	22	98/97	95	97	98	97/	96	96	97	94	94	96	95	93	95/90	95/89	91/78	86	75	72/71	72	74	70/43	6	64/45	23	28
CH7	3	31/96	94	96	96	95/91	91	92	97	97	90	89	88	90/89	94/93	92/65	78	65	67/81	82	83	79/45	5	61/34	12	31		
GRABS	4	9	99/99	99	99/96	96	97	95	94	94	94	93	94	93/92	91/95	90/74	87	75	81/80	81	82	80/39	13	46/36	23	24		
PV16	5	21	99	99	99/95	96	96	95	94	92	91	94	91/94	91/96	98/73	85	72	80/80	82	83	82/65	22	40/38	19	29			
GV1	6	10	99/99/96	97	97	96	95	95	94	94	93/95	94/94	96/76	86	72	76/77	78	79	79/60	13	48/45	18	33					
MGVI	7	13	99/95	97	97	95	94	94	93	94	93/95	93/95	96/75	84	71	74/77	78	80	80/60	12	49/46	16	35					
SGVI	8	30	1/93	97	97	95	95	94	93	94	92/96	94/95	97/73	84	70	75/78	79	80	81/63	16	45/46	15	35					
CLAI	9	6	97	99	98	98	98	97	97	97	97/88	89/85	92/87	95	87	84/84	65	66	62/45	4	55/43	41	13					
GVSB	10	11	99/99	99/98	98/95	94	92	93	86	91/87	90	78	76/63	64	66	66/54	8	53/56	26	30								
LAI	11	12	99/99	99	98/91	93/90	92/87	52/86	92	81	79/64	66	67	66/50	6	53/50	31	23										
NDS	12	17	99/98	98/96	94/89	89/84	91/89	94	83	82/60	61	63	62/53	13	49/52	35	20											
TV16	13	34	1/90	98/95	95	88/88	88/64	91/89	93	83	81/59	61	62	62/53	13	49/52	34	20										
ND7	14	18	99/94	97	97	87	92/81	87/90	94	84	76/56	38	39	37/40	4	63/54	37	20										
TV17	15	35	1/94	94/86	90/80	86/71	92	82	75/54	56	57	55/40	3	63/55	35	21												
R65	16	25	98/88	89/84	91/85	95	87	1/61	63	64	63/51	11	48/48	42	18													
R75	17	27	1/84	91/81	87/86	94	86	79/58	60	61	58/58	5	61/49	42	19													
R64	18	24	73/90	89/69	73	55	58/72	73	79	81/70	17	40/60	3	37														
R74	19	26	1/83	84/74	73	60	54/66	66	69	70/47	9	63/62	3	32														
CH6	20	41	97/93	72	57	74/72	93	94	93/71	29	29/23	4	32															
SVVI	21	33	66	83	71	83/83	86	87	83/68	30	31/23	22	20															
CH5	22	3	91	87/68	20	21	23	23/26	6	56/67	33	9																
DLAI	23	20	1/97	88/47	49	50	44/36	7	48/37	63	6																	
R45	24	23	1/88/33	35	35	27/19	2	43/25	80	27																		
HYVI	25	16	1/60	62	61	53/46	36	18	0	63	30																	
MSBI	26	15	99/99/96/65	32	14	7	11	23																				

SSBI	NO	NAME	VARIABLE	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
SBI	2	AVI	1	36	99/95
SBI	3	PV17	22	1	99/95
SBI	4	CH7	3	1	97/77
SNSI	5	GRABS	9	30	99/35
SNSI	6	PV16	21	9	99/35
SNSI	7	GV1	10	30	99/35
MNSI	8	MGVI	10	10	99/34
MNSI	9	SGVI	10	10	96/73
MNSI	10	CLAI	6	27	95/67
MNSI	11	GVSB	11	35	98/52
NSI	12	LAI	12	11	99/50
NSI	13	NDS	17	34	99/24
R76	14	TV16	18	33	99/38
CH4	15	ND7	18	33	99/38
CH4	16	TV17	23	6	98/40
ELAI	17	R65	23	21	98/30
ELAI	18	R75	27	26	98/30
ELAI	19	R64	24	26	98/30
YVI	20	CH4	24	33	97/99
YVI	21	SVVI	33	1	90/36
YVI	22	CH5	16	21	81/80
YVI	23	DLAI	20	20	93/04
YVI	24	R45	20	20	99/39
YVI	25	MHII	15	31	96/39
YVI	26	MSBI	15	15	99/98
YVI	27	SSBI	20	15	99/95
YVI	28	SNSI	21	1	99/95
YVI	29	MNSI	14	20	98/89
YVI	30	R41	19	14	80/17
YVI	31	R74	20	1	87/81
YVI	32	CH4	20	36	41/23
YVI	33	ELAI	36	36	72/43
YVI	34	YVI	36	1	30/42

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Yolo County - May 2, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD																		
VARIABLE NAME	NO	AVI	(1)	99/95 92 95/95 93 90 91 95 87 89/87 84 92 92 89/71 83/20 67/ 2	4 97 63/59 69 7B 9 10 12 13 25 9 3B/													
PV17	(22)	93 90 93/94 91 88 88 93 85 82/87 86 92 93 90/71 82/24 61/ 4	5 57 60/57 72 83 16 1B 19 20 26 10 37/															
ND7	(18)	99/99/94 93 94 93 95 92 91/76 75 86 84 82/69 82/47 84/ 8	2 54 73/32 96 98 16 14 13 9 19 3 41/															
R75	(27)	94/92 92 91 90 93 93 91/74 72 83 81 79/67 80/49 82/14 3 92 73/30 94 96 15 14 13 9 17 4 40/																
TV17	(35)	94 94 93 94 94 88 89/76 75 86 85 83/80 80/48 84/ 3 1 93 69/32 96 98 16 14 12 8 20 6 41/																
CLA1	(6)	94 96 96 97 94/95 91 89 93 91 90/67 68/22 72/14 21 76 79/54 77 6B 8 10 11 12 31 29 1B/																
GVSB	(11)	98 98/90/95 89/84 87 94 93 93/84 83/48 7B/10 9 96 62/48 68 60 2 1 0 11 47 30 1/																
ND6	(17)	99/98/97/94/06 88 93 91 92/7B 73/39 79/ 2	4 67 72/48 73 56 1 0 1 9 47 37 8/															
TV16	(34)	90/96/94/06 88 93 91 92/77 73/40 80/ 0 4 67 71/48 72 56 2 0 0 9 47 37 7/																
LAI	(12)	96/92/89 89 95 94 93/77 78/35 74/ 0 4 65 70/53 74 66 4 6 8 14 42 30 17/																
R65	(29)	94/84 83 90 88 89/76 71/37 77/ 8 6 66 73/47 71 54 1 0 1 9 46 38 6/																
DLA1	(20)	80 7B 82 79 79/55 55/26 81/33 31 7B 90/37 67 47 8 6 5 4 27 30 13/																
GRABD	(9)	98/95 95 95/70 59/ 4 41/ 2 21 79 59/83 95 84 47 48 49 50 34 50 3/																
PV16	(21)	97 97 97/78 62/ 4 42/13 9 74 93/84 95 79 44 46 47 93 66 98 14/																
GV1	(10)	99/99/85 76/23 56/17 1 65 54/73 86 77 2B 30 31 40 99 44 2/																
HOVI	(19)	99/86 79/52 53/22 5 61 49/74 85 80 31 32 34 43 59 42 4/																
SCVI	(30)	88 76/23 53/23 6 62 49/75 86 76 30 32 34 44 65 48 2/																
R64	(24)	86/53 49/56 51 22 16/36 59 55 12 13 16 39 73 41 5/																
R74	(26)	63 61/43 49 7 22/31 37 61 10 9 6 9 30 6 44/																
CH4	(2)	71/36 68 34 3/38 26 19 74 74 71 48 10 21 34/																
CH5	(3)	19 , 3 33 70/12 19 8 60 59 58 50 6 2 36/																
ELAI	(8)	85/49 70/26 2 18 19 18 21 47 52 14 13/																
YVI	(36)	71 62/13 30 9 23 24 21 7 31 11 6/																
HYVI	(16)	82/60 83 48 36 38 37 25 31 56 23/																
R45	(23)	16 30 27 15 13 14 27 3 15 17/																
CH6	(4)	92/81/85 86 87 91/87 66 37/																
NAME	NO	VARIABLE	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED													
SYVI	(33)	78/65 66 67 66/65 68 30/	2B	35	34 18													
		AVI	1	22	59 67													
		PV17	22	1	58 67													
		ND7	18	35	58 67													
		RT9	27	18	53 48													
		TV17	35	1	53 48													
		CLA1	6	20	53 48													
		GVSB	11	25	96 59													
		ND6	17	24	99 96													
		TV16	34	11	98 95													
		LAI	12	11	98 95													
		RT5	25	6	96 21													
		DLA1	20	1	91 91													
		GRABD	9	30	96 20													
		PV16	21	9	98 71													
		GV1	10	30	97 68													
		HOVI	10	10	97 68													
		SCVI	10	1	86 25													
		R64	24	26	86 61													
		R74	25	13	74 85													
		CH4	26	13	71 89													
		CH5	33	1	58 20													
		ELAI	53	1	53 33													
		YVI	35	23	81 83													
		HYVI	16	23	82 10													
		R45	23	1	36 24													
		CH6	4	38	47 63													
		SYVI	25	4	72 25													
		CH7	15	31	10 58													
		MSBI	15	31	99 98													
		SSDI	35	13	99 93													
		SDI	29	13	71 39													
		SNSI	21	14	79 54													
		MNSI	14	28	88 50													
		NSI	19	14	88 50													
		R76	28	1	94 18													

OF POOR QUALITY

Yolo County - May 11, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD		NAME NO.	VARIABLE NO.	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
ITEM	ITEM					
AVI	1	11	89/98 90 97/97 97 96 94 94 93 92/87 84 94 92 90/71 87/86/70 74 26/67 84 96 95 95 95 12 32/16 8 11 59/			
PVI7	1	22)	96 96 96/96 96 95 92 92 92 70/89 86 94 94 91/72 87/60/68 76 26/61 78 40 47 47 47 47 3 41/20 6 11 57/			
ND7	1	18)	99/99/97 97 97 96 95 95 93/93 81 92 89 88/60 85 31/73 84 31/73 89 65 64 64 63 22 19 9 9 9 59/			
TV17	1	35)	98/97 97 96 95 95 94 94/82 80 92 89 88/67 84/49/73 84 31/73 90 67 66 66 65 24 17/10 11 10 60/			
R75	1	27)	97 97 96 96 95 96 95/80 82 92 89 89/69 83/38/72 84 30/72 88 63 62 61 60 19 21 8 7 7 56/			
CLAI	1	6)	99/90 90 90 97/98/92 91 96 94 94/71 79/67/81 86 30/61 83 52 51 50 51 4 29/10 3 7 49/			
LAI	1	12)	99 99 99 98/97/92 91 97 95 95 93/75 82/66/78 83 31/63 84 34 32 32 30 3 26/17 3 10 41/			
GV80	1	11)	99 99 98/96/89 91 98 96 96/81 86/63/78 78 22/70 84 55 54 53 49 6 23/23 14 11 40/			
ND6	1	17)	99/99/98/91 91 97 94 95/75 79/67/80 84 32/66 84 54 53 53 50 5 20/16 14 18 34/			
TV16	1	34)	98/98/91 91 97 94 95/75 70/67/81 84 33/68 85 55 54 53 51 6 20/16 14 18 34/			
R64	1	25)	98/90 90 91 96 95 94/76 79/67/79 84 31/64 83 33 31 31 48 4 22/14 13 18 33/			
OLAI	1	20)	87 87 92 88 89/64 71/65/87 92 46/61 86 57 56 36 35 57 11 13/ 6 4 15 37/			
GRADS	1	9)	98/95 95 94/73 68/89/70 73 3/33 38 18 17 17 17 31 33/21 23 29 17/			
PVI6	1	21)	96 96 97/81 71/89/74 67 24/30 58 18 17 17 14 32 49/31 38 38 9/			
OVI	1	10)	99 99/85 84/71 71 72 19/59 73 39 38 37 34 11 39/33 24 19 30/			
MGVI	1	13)	99/88 86/76/65 65 12/55 67 32 30 30 25 19 47/39 20 18 29/			
BGVI	1	30)	88 84/77/66 66 12/56 68 33 32 31 26 18 42/40 33 24 24/			
R64	1	24)	87/58/29 29 32/59 48 20 20 18 5 25 42/72 34 25 12/			
R74	1	26)	36/30 44 20/76 68 47 47 45 37 7 37/33 8 20 58/			
SYVI	1	33)	68 31 34/ 6 22 20 22 22 20 64 61/19 50 58 24/			
HYVI	1	16)	94/80/28 70 43 41 42 30 7 2/32 2 32 13/			
R45	1	23)	74/47 83 62 61 62 69 29 3/38 22 6 40/			
VVI	1	36)	12 36 24 23 25 42 17 12/76 41 10 11/			
CH4	1	2)	66 68 68 87 77/62 30/27 8 22 59/			
CH3	1	3)	90 89 89 87/57 24/ 5 20 10 58/			
MSDI	1	15)	99/99/97/86 56/16 40 30 64/			
SSDI	1	32)	99/97/86 56/16 40 31 64/	NAME NO.	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER
SBI	1	29)	97/87 57/18 41 30 64/	PVI7	25	1
			ND7	18	27	
			TV17	35	18	
			R75	27	1	
			CLAI	27	20	
			LAI	15	20	
			GV80	11	25	
			ND6	17	25	
			TV16	34	17	
			R64	25	6	
			OLAI	25	6	
			GRADS	9	30	
			PVI6	21	9	
			OVI	10	30	
			MGVI	13	30	
			BGVI	20	1	
			R74	26	25	
			SYVI	33	1	
			HYVI	16	36	
			R45	23	16	
			YII	35	16	
			CH4	34	3	
			CH3	35	3	
			MSDI	15	31	
			SSDI	20	15	
			MSI	25	15	
			CH4	36	6	
			CH7	36	6	
			ELAI	18	44	
			MNSI	14	30	
			NSI	19	23	
			R76	26	17	

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Yolo County - May 12, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD VARIABLE NO.		NAME NO.	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
AVI	(1 99/99 99 98 98 94 96 97 95 95 94 94 93 91/89 07/73 89/73 01/89/89 05 60 59 58 59 15/33/42 23/ 8 17 67/	AVI	1	99
PV17	(22/97 97 96/97 92 94 96 93 93 93 94 94 92/91 80/74 09/71 79/69/63 79 52 51 50 51 6/48/45 22/ 7 18 66/	PV17	22	99
ND7	(10/99/99/98 96 97 98 96 96 94 92 91/86 03/74 09/74 04/54/74 09 67 66 66 63 23/23/40 22/ 6 14 65/	ND7	10	99
TV17	(33/90/97 96 96 97 96 96 93 93 91 90/86 04/72 08/73 04/93/73 90 69 68 67 67 23/22/40 23/ 8 14 66/	TV17	33	99
R75	(27/97 96 96 97 96 95 97 93 92 91/86 03/76 90/72 80/53/73 87 64 63 63 62 20/26/39 20/ 3 13 64/	R75	27	99
CLAI	(61 98/97 99 98 98 97/97 95 94/93 92/74 04/82 06/68/65 04 57 56 55 55 9/30/40 29/ 2 0 54/	CLAI	61	99
DLAI	(20/98 98 98 98 97/94 91 91/90 90/70 79/83 90/63/67 08 62 61 61 61 16/18/33 33/ 4 7 48/	DLAI	20	99
GVBD	(11/99 99 99/98/98 98 97 97/90 92/83 90/72 77/64/73 84 61 60 59 54 11/24/53 11/13 6 48/	GVBD	11	99
LAI	(12/99 99/98 98 96 96/92 92/77 87/70 02/67/70 86 59 58 58 55 10/27/47 21/ 9 3 51/	LAI	12	99
ND6	(17/99/99/98 93 98/91 93/81 03/77 02/67/72 87 61 60 59 56 11/21/48 19/13 11 44/	ND6	17	99
TV16	(34/70/98 95 96/91 93/80 03/79 02/67/72 87 61 60 59 56 11/20/48 20/15 12 44/	TV16	34	99
R63	(25/97 95 95/91 92/82 07/76 01/66/71 03 50 57 57 53 7/23/47 17/13 10 44/	R63	25	99
SVI	(10/99/99/75 97/87 89/72 73/73/66 78 49 48 47 42 3/33/39 10/22 12 41/	SVI	10	99
MVVI	(13/99/73 97/80 90/67 69/73/63 73 42 41 40 35 10/43/62 3/23 11 40/	MVVI	13	99
BVVI	(30/94 97/70 09/68 67/73/65 74 44 43 42 36 8/37/65 3/30 10 33/	BVVI	30	99
GRADS	(91/98/74 73/79 71 88/41 63 27 25 25 26 24/53/44 29/17 15 33/	GRADS	91	99
PV16	(21/63 79/74 69/87/49 65 30 28 28 24 22/46/36 15/33 27 24/	PV16	21	99
R64	(24/90/33 04/57/69 59 36 35 33 19 13/30/07 37/33 14 19/	R64	24	99
R74	(26/40 01/44/78 74 54 53 52 44 10/33/69 20/12 16 5/	R74	26	99
MVVI	(16/94/68/34 71 46 45 43 34 10/10/ 3 72/ 8 18 29/	MVVI	16	99
R45	(23/32/48 01 62 61 61 70 30/ 6/ 0 67/27 6 53/	R45	23	99
SVVI	(33/ 1 23 14 15 15 14 60/64/35 29/39 44 6/	SVVI	33	99
CH4	(2) 89 89 89 89 77/61/31/33 21/ 9 8 59/	CH4	2	99
CH5	(3) 91 91 90 88/58/20/30 23/10 8 59/	CH5	3	99
MSDI	(15/99/99/98/84/52/14 13/22 21 58/	MSDI	15	99
SSDI		VARIABLE NO.	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
SDI	(29/97/86/33/12 14/24 22 58/	SDI	29	99 99
	AVI	1	1	99 00
	PV17	22	1	99 78
SNSI	(31/87/49/ 6 34/43 33 66/	ND7	18	99 99
	TV17	33	18	99 99
CH6	(4/73/22 12 14/24 22 58/	R75	27	99 60
	CLAI	20	6	99 99
	DLAI	20	6	99 99
	GVBD	11	54	99 99
	LAI	13	54	99 99
CH7	(5/24 2/ 2 15 18/	ND6	17	99 99
	TV16	34	11	99 99
	SVI	10	30	99 99
	MVVI	13	30	99 99
	BVVI	30	1	99 99
	GRADS	30	21	99 99
	PV16	31	26	99 99
	R64	26	21	99 99
	MVVI	16	20	99 99
	R45	16	1	99 99
	SVVI	33	4	99 99
	CH4	31	1	99 99
	CH5	31	1	99 99
	MSDI	15	15	99 99
	SSDI	29	14	99 97
	SDI	31	14	99 97
	SNSI	31	1	99 97
	CH6	43	1	99 97
	CH7	33	1	99 97
	ELAI	8	36	99 97
	YVI	36	26	99 97
	MNSI	14	28	99 97
	NSI	19	14	99 97
	R76	28	14	99 97

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Yolo County - May 20, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DIATANCE METHOD NAME NO		VARIABLE NO	OTHER BOUNDARY OF CLUSTER	NUMBER OF ITEMS IN CLUSTER	DISTANCE OR SIMILARITY WHEN CLUSTER FORMED
NAME	NO				
AVI	1	99/99/99 99/97 96 92 92 92 93 93 94 91 88 89 89/81/94 51 78/72 92 79 78 78 78 41/77 81 43/17 4 58/ 9	1	35	99 99
TV17	2	99/99 98/97 96 92 92 92 93 93 94 91 88 90 89/81/94 51 78/72 92 70 70 78 77 40/77 81 43/17 4 58/10	1	35	99 99
PV17	3	22/99 99/97 95 91 91 91 92 92 93 91 88 90 89/68/94 51 89/69 89 74 74 74 74 36/75 79 44/18 6 60/17	1	35	99 97
ND7	4	10/99/97 96 93 93 93 94 93 94 91 88 90 89/63/93 51 79/70 90 76 75 75 75 37/68 81 43/16 4 58/12	1	35	99 97
R75	5	27/97 96 93 92 93 94 92 94 91 88 90 89/63/93 51 52 79/69 89 74 74 74 74 36/76 81 44/16 3 57/14	1	35	97 96
CLAI	6	61 93/97 97 97 98/96 96 93 92/96 92/74/54 55 71/67 91 74 73 73 73 31/65 86 51/ 6 13 42/ 5	1	35	93 97
LAI	7	12/98 90 90 97/97 98 96 93/93 93/74/62 61 73/70 90 72 72 71 68 27/80 80 42/ 2 18 38/ 5	1	35	98 90
ND6	8	17/99/99/99/98 99 96 97/96 97/79/65 65 70/70 89 70 69 69 64 21/62 79 41/13 31 25/ 0	1	35	99 99
TV16	9	34/99/98/98 99 96 97/96 97/79/65 65 70/70 89 71 70 70 65 22/82 77 41/13 31 24/ 1	1	35	99 98
R65	10	23/99/98 98 96 96 96/79/63 63 71/68 88 69 68 68 68 20/81 79 40/13 30 25/ 2	1	35	98 98
DLAI	11	20/76 96 93 93/96 94/79/54 55 64/63 90 71 70 71 69 26/87 86 51/ 4 27 29/ 1	1	35	96 93
GVI	12	10/99/99 99/93 97/77/74 73 79/74 86 67 67 66 59 17/74 70 27/10 29 27/ 7	1	35	99 99
QVBD	13	11/99 98/94 96/73/72 72 73/75 88 70 69 69 62 20/74 72 39/13 26 30/ 3	1	35	98 94
MVVI	14	13/99/94 96/76/70 70 83/73 82 62 61 61 52 10/68 64 21/22 28 27/14	1	35	99 94
SOVI	15	30/73 97/77/80 80 80/74 81 62 61 60 51 7/68 63 17/29 36 17/ 8	1	35	97 73
GRADS	16	9/97/89/97 97 64/91 79 55 54 54 5/93 81 50/ 9 31 25/17	1	35	97 89
PV16	17	21/89/70 71 67/59 77 53 52 52 46 0/77 70 33/29 45 11/11	1	35	89 70
BYVI	18	33/46 49 35/18 49 18 17 17 18 32/77 63 46/33 60 12/24	1	35	46 35
CLAI	19	81 73/70/74 49 37 37 35 14 8/17 7 33/60 40 3/ 7	1	35	73 70
R64	20	24/75/69 43 29 28 26 3 19/14 6 40/67 45 0/14	1	35	75 69
R74	21	26/70 63 53 53 52 40 16/25 30 16/10 12 53/33	1	35	70 63
CH4	22	21 82 83 83 84 67/56/33 36 10/14 3 32/32	1	35	82 83
CH5	23	31 94 93 94 99/62/77 92 47/14 3 43/29	1	35	94 93
M80I	24	15/99/99/95/83/62 68 37/26 12 48/47	1	35	99 95
S80I	25	32/99/99/83/61 67 37/26 12 48/48	1	35	99 99
SDI	26	29/96/84/62 69 39/27 12 48/48	1	35	96 84
GNSI	27	31/86/71 80 60/49 24 58/41 NAME NO VARIABLE NO OTHER BOUNDARY OF CLUSTER NUMBER OF ITEMS IN CLUSTER DISTANCE OR SIMILARITY WHEN CLUSTER FORMED	1	35	86 71
AVI	28	AVI 1 3 35 99 99	1	35	99 99
TV17	29	TV17 35 1 35 99 99	1	35	99 99
PV17	30	PV17 35 1 35 99 99	1	35	99 99
ND7	31	ND7 27 1 35 99 99	1	35	99 99
R75	32	R75 27 1 35 99 99	1	35	99 99
CLAI	33	CLAI 21 1 35 99 99	1	35	99 99
LAI	34	LAI 12 1 35 99 99	1	35	99 99
ND6	35	ND6 20 1 35 99 99	1	35	99 99
TV16	36	TV16 17 1 35 99 99	1	35	99 99
R65	37	R65 17 1 35 99 99	1	35	99 99
DLAI	38	DLAI 14 1 35 99 99	1	35	99 99
GVI	39	GVI 10 1 35 99 99	1	35	99 99
QVBD	40	QVBD 10 1 35 99 99	1	35	99 99
MVVI	41	MVVI 10 1 35 99 99	1	35	99 99
HNSI	42	HNSI 10 1 35 99 99	1	35	99 99
MSDI	43	MSDI 10 1 35 99 99	1	35	99 99
SDSI	44	SDSI 13 1 35 99 99	1	35	99 99
BNGI	45	BNGI 15 1 35 99 99	1	35	99 99
CH6	46	CH6 14 1 35 99 99	1	35	99 99
MYVI	47	MYVI 16 1 35 99 99	1	35	99 99
R45	48	R45 16 1 35 99 99	1	35	99 99
VVI	49	VVI 10 1 35 99 99	1	35	99 99
MNSI	50	MNSI 10 1 35 99 99	1	35	99 99
TR40S	51	TR40S 21 1 35 99 99	1	35	99 99
PV16	52	PV16 21 1 35 99 99	1	35	99 99
SIVI	53	SIVI 21 1 35 99 99	1	35	99 99
ELAI	54	ELAI 26 1 35 99 99	1	35	99 99
R64	55	R64 26 1 35 99 99	1	35	99 99
CH4	56	CH4 24 1 35 99 99	1	35	99 99
CH5	57	CH5 24 1 35 99 99	1	35	99 99
MSDI	58	MSDI 31 1 35 99 99	1	35	99 99
SDSI	59	SDSI 31 1 35 99 99	1	35	99 99
BNGI	60	BNGI 29 1 35 99 99	1	35	99 99
CH6	61	CH6 24 1 35 99 99	1	35	99 99
MYVI	62	MYVI 16 1 35 99 99	1	35	99 99
R45	63	R45 16 1 35 99 99	1	35	99 99
VVI	64	VVI 26 1 35 99 99	1	35	99 99
MNSI	65	MNSI 14 1 35 99 99	1	35	99 99
NSI	66	NSI 14 1 35 99 99	1	35	99 99
R76	67	R76 19 1 35 99 99	1	35	99 99
CH7	68	CH7 9 1 35 99 99	1	35	99 99

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Yolo County - May 29, 1978 - Field

TREE PRINTED OVER ABSOLUTE CORRELATION MATRIX CLUSTERING BY AVERAGE DISTANCE METHOD VARIABLE											
NAME	NO	NAME	NO	NAME	NO	NAME	NO	NAME	NO	NAME	NO
AVI	1	11	99/90/99	97/97	92	93	93	92	93	93	93/74
TV17	2	35	1/99/99	98/97	94	94	94	93	93	93	94/76
PV17	3	22	1/90/90	90	93	93	93	93	93	93	93/80
ND7	4	10	99/90	93	94	93	93	93	93	93	93/77
R7D	5	27	1/97	94	94	95	94	94	92	93	94/77
CLA1	6	6	90	90	90	97/90	96	96	90/96	90	90/03
ND6	7	17	99/99/99	90	97	97	99/90	96	93/84	94/03	74
TV16	8	34	1/99/99/90	97	97	99/93/06	93/04	04/04	74	76/61	70
DLA1	9	20	1/99/97	96	95	90/95/07	92/06	00/79	69	74/59	78
R65	10	25	1/97	97	96	90/96/06	92/02	04/02	73	70/60	76
AVI	11	10	99/99/99/99	94	91/77	70/09	79	8/66	80	64	63
GVVI	12	30	1/99/99/94/04	92/74	73/92	84	03/64	76	60	59	59/59
MOV1	13	13	1/99/94/07	93	73/91	83	03/59	72	55	54	54/54
GVGB	14	11	1/96/03	90/77	79/80	79	04/66	80	63	63	63/63
LAI	15	12	1/01	06/77	81/79	72	00/62	77	62	61	61/61
GRAB8	16	9	97/03	70/67	59	59/16	41	17	16	14	21/7
PV16	17	21	1/01	73/00	72	64/32	52	30	29	29	31/4
MYVI	18	16	76/48	30	33/34	63	43	44	45	53	27/23/31
R45	19	23	1/44	28	43/42	70	54	53	54	62	38/20/38
ELA1	20	8	93/87/65	67	54	54	53	49	32	23/23	9/33
R64	21	24	1/06/96	56	52	41	41	40	33	20	12/22
R74	22	26	1/72	71	62	62	61	59	46	23/0	17/2
CH4	23	2	93	97	67	97	93/91/02	46	20/0	18	69/
CH5	24	3	96	96	96	96/07	76/23	13/18	8	63/	/
M9D1	25	15	99/99/90/96	07/46	1/23	19	63/	/	/	/	/
S9B1	26	32	99/99/96/89/46	2/23	20	63/	/	/	/	/	/
NAME	NO	NAME	NO	NAME	NO	NAME	NO	NAME	NO	NAME	NO
AVI	1	24	19	63	20	35	35	35	35	35	29/19
TV17	2	35	1	27	27	27	27	27	27	27	99/95
PV17	3	25	1	27	27	27	27	27	27	27	99/71
ND7	4	18	1	27	27	27	27	27	27	27	98/65
R75	5	27	1	27	27	27	27	27	27	27	99/50
CLA1	6	6	12	12	12	12	12	12	12	12	99/40
ND6	7	17	12	23	23	23	23	23	23	23	99/36
TV16	8	34	17	17	17	17	17	17	17	17	99/31
DLA1	9	64	20	20	20	20	20	20	20	20	98/26
R65	10	55	6	6	6	6	6	6	6	6	99/20
GVVI	11	10	11	11	11	11	11	11	11	11	98/16
MOV1	12	13	10	10	10	10	10	10	10	10	99/10
GVGB	13	11	6	6	6	6	6	6	6	6	97/6
LAI	14	6	6	6	6	6	6	6	6	6	97/4
GRAB8	15	21	21	21	21	21	21	21	21	21	94/79
PV16	16	21	21	21	21	21	21	21	21	21	97/40
MYVI	17	16	23	23	23	23	23	23	23	23	98/31
R45	18	20	21	21	21	21	21	21	21	21	98/03
ELA1	19	20	26	26	26	26	26	26	26	26	98/30
R64	20	24	26	26	26	26	26	26	26	26	97/17
R74	21	26	21	21	21	21	21	21	21	21	94/12
CH4	22	3	3	3	3	3	3	3	3	3	98/6
CH5	23	4	4	4	4	4	4	4	4	4	98/5
M9D1	24	19	19	19	19	19	19	19	19	19	98/0
S9B1	25	15	15	15	15	15	15	15	15	15	100/00
BD1	26	51	51	51	51	51	51	51	51	51	99/94
SNS1	27	51	51	51	51	51	51	51	51	51	99/93
CH6	28	4	4	4	4	4	4	4	4	4	99/97
CH7	29	5	5	5	5	5	5	5	5	5	99/00
SVVI	30	33	33	33	33	33	33	33	33	33	99/71
YVI	31	36	22	4	4	4	4	4	4	4	99/69
MNS1	32	80/70	/	/	/	/	/	/	/	/	/
NS1	33	19/75	/	/	/	/	/	/	/	/	/
R76	34	26	/	/	/	/	/	/	/	/	/

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Yolo County - June 16, 1978 - Field

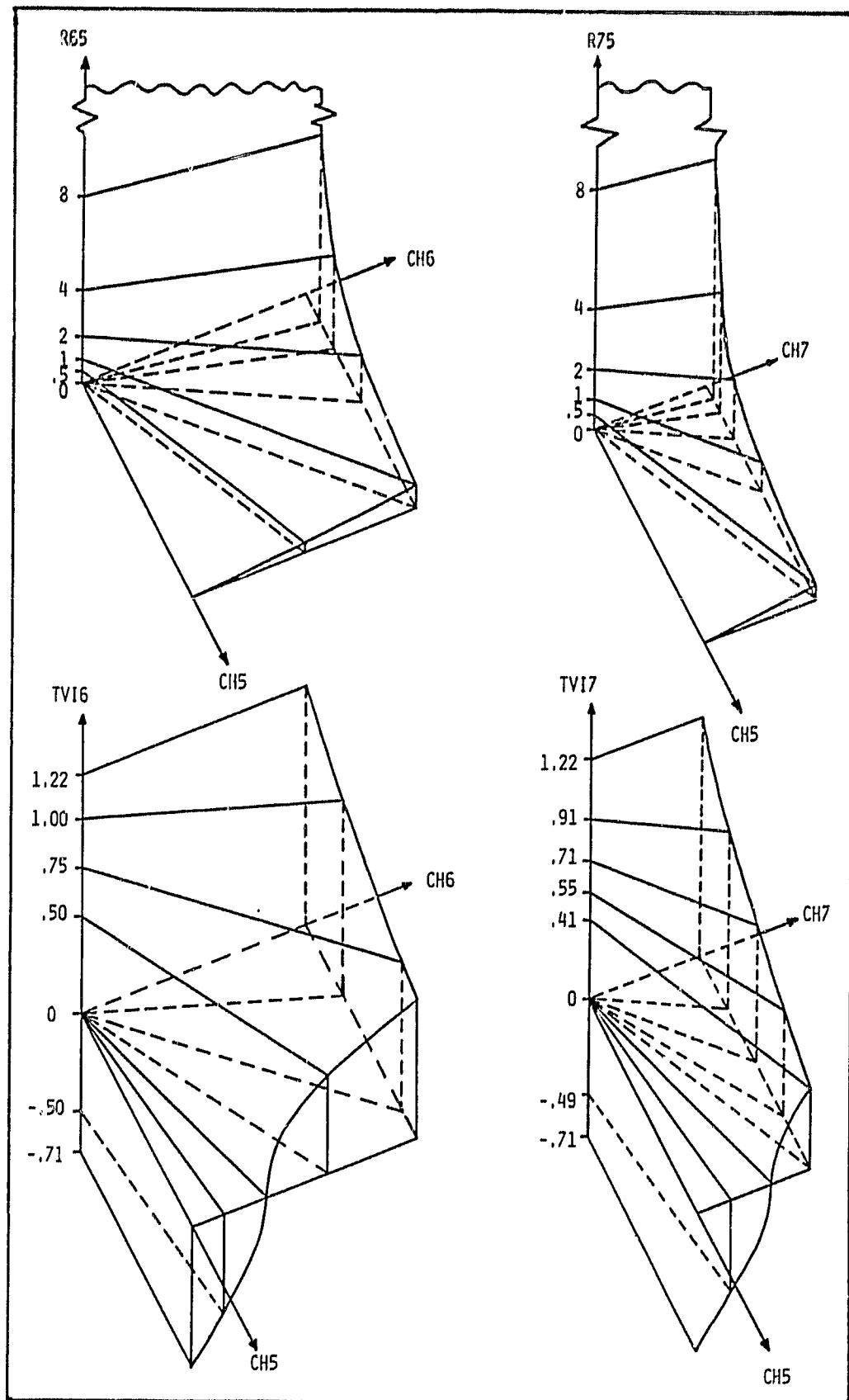
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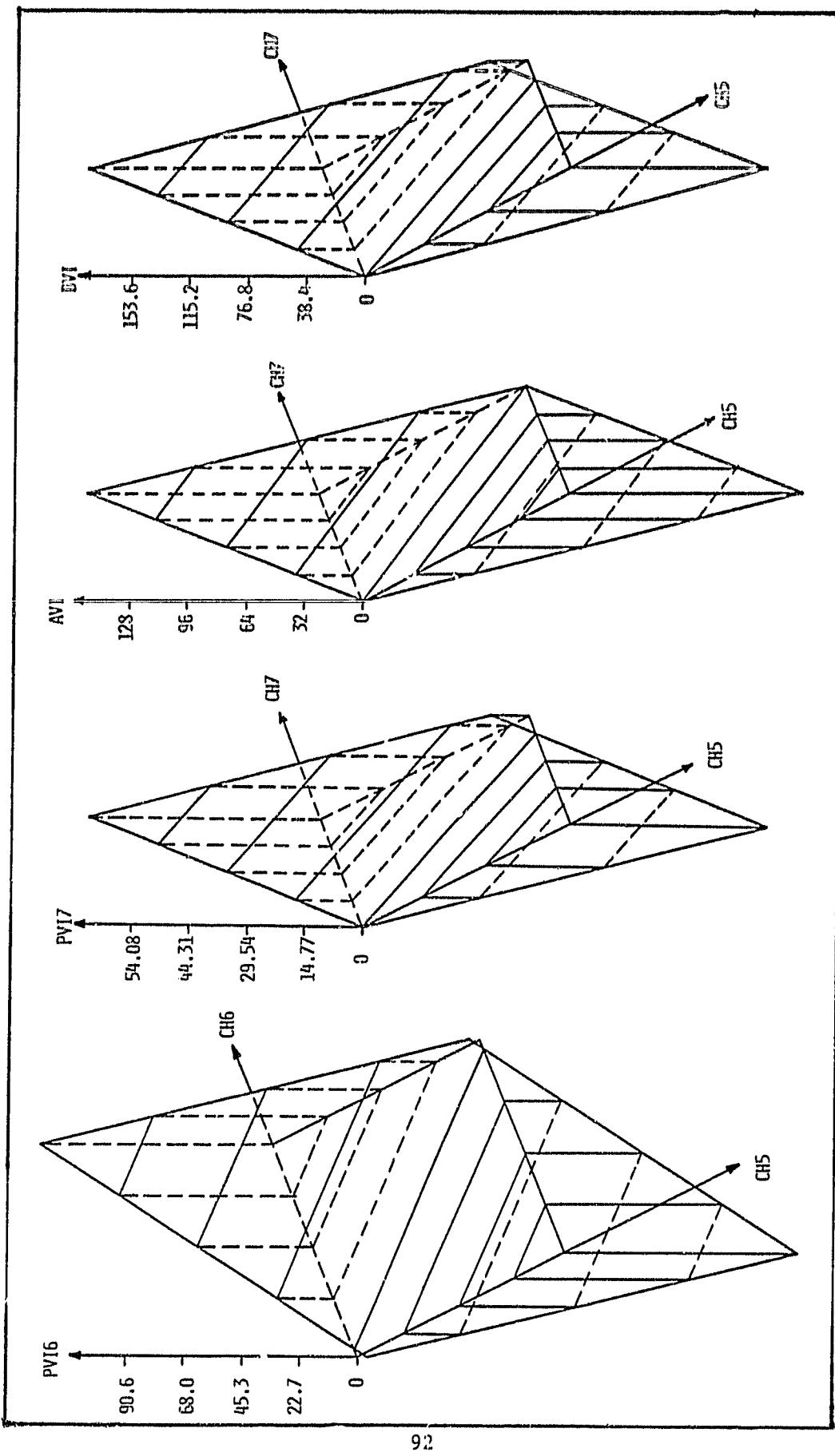
APPENDIX C

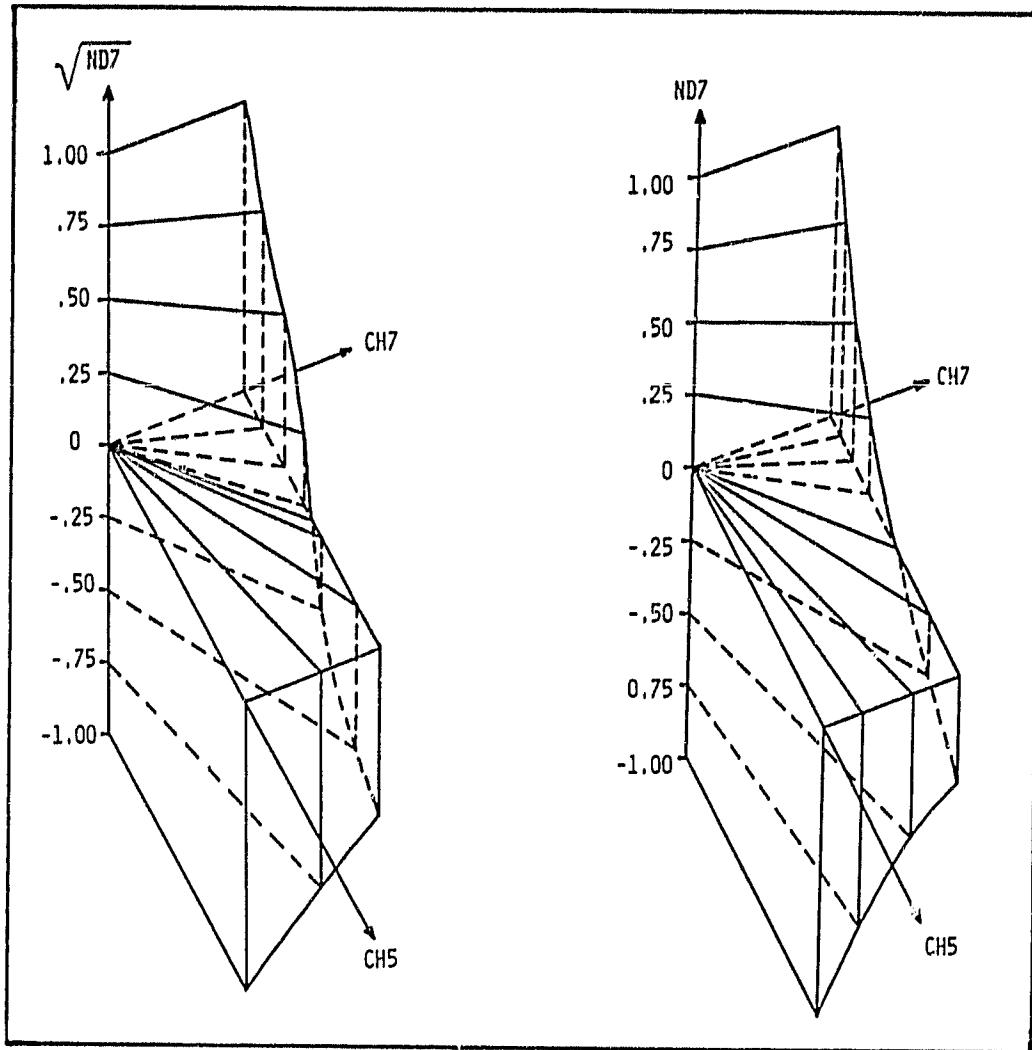
GRAPHICAL REPRESENTATION OF VEGETATION INDICES

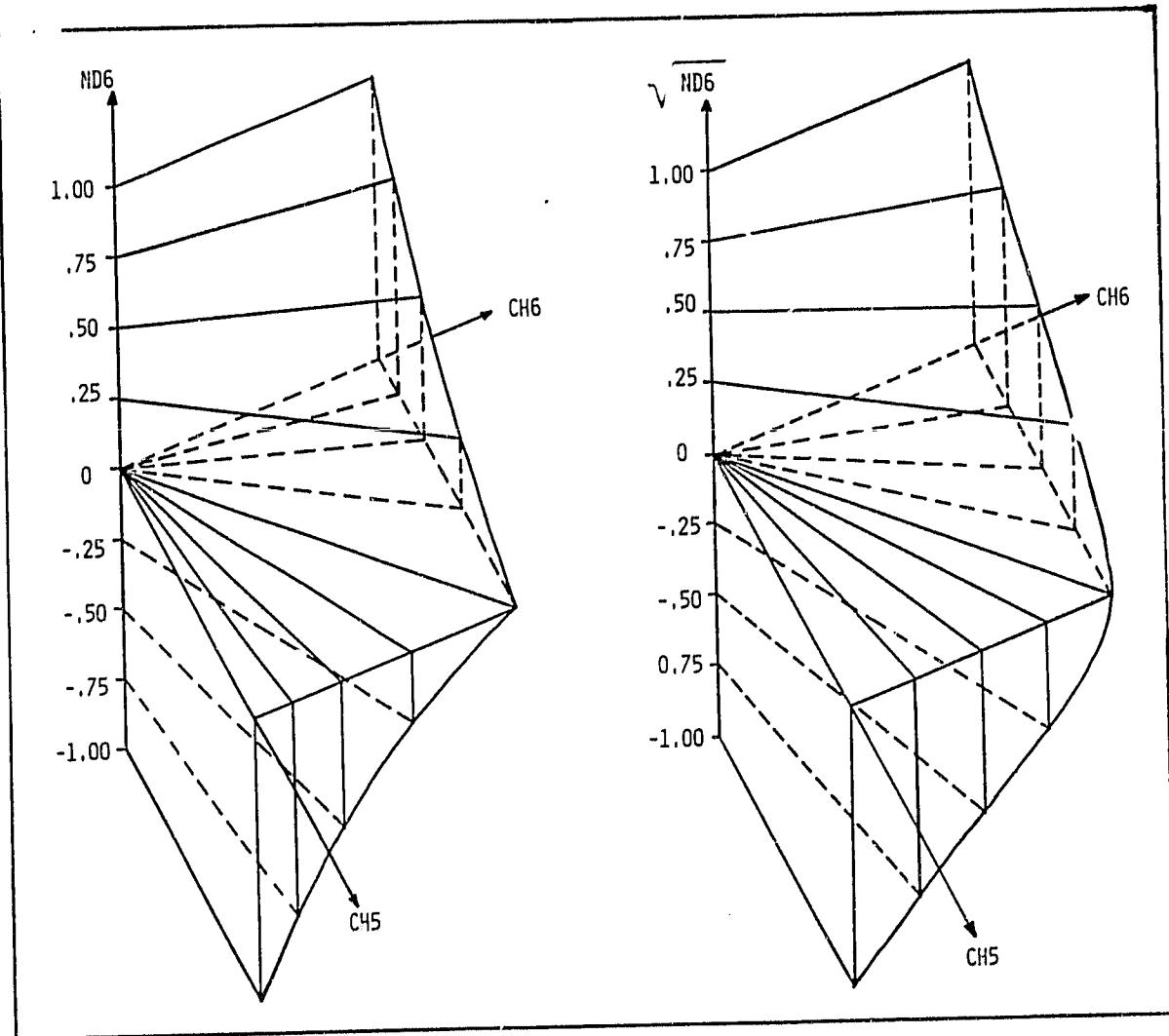
Part 1. Graphical representation of response surfaces and equivalent classes associated with VIs involving two MSS channels.

Graphs for the square root of ND6 and ND7 are included in this appendix. They probably have been studied by other investigators; however, we found no specific reference to them.









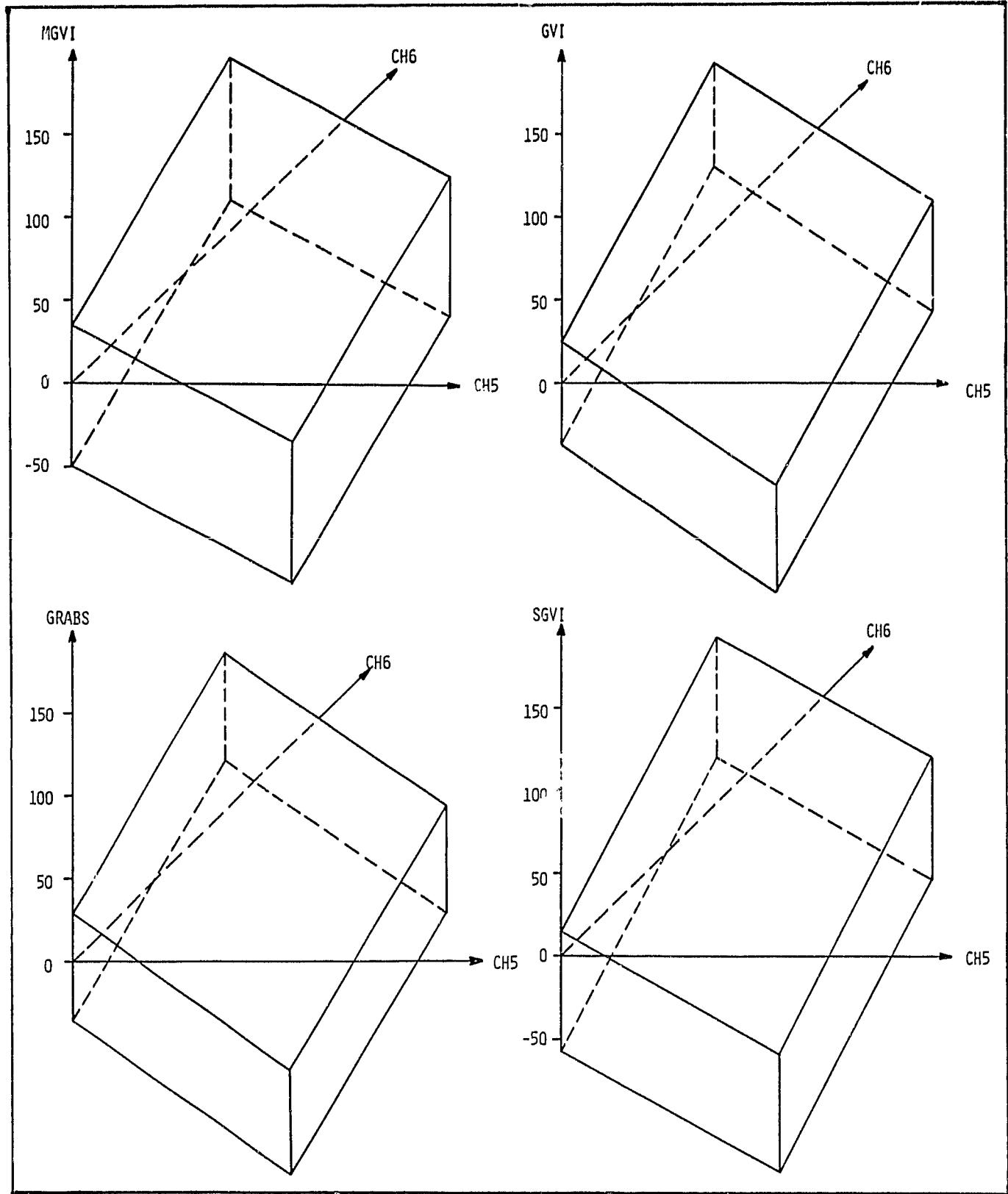
C - 2

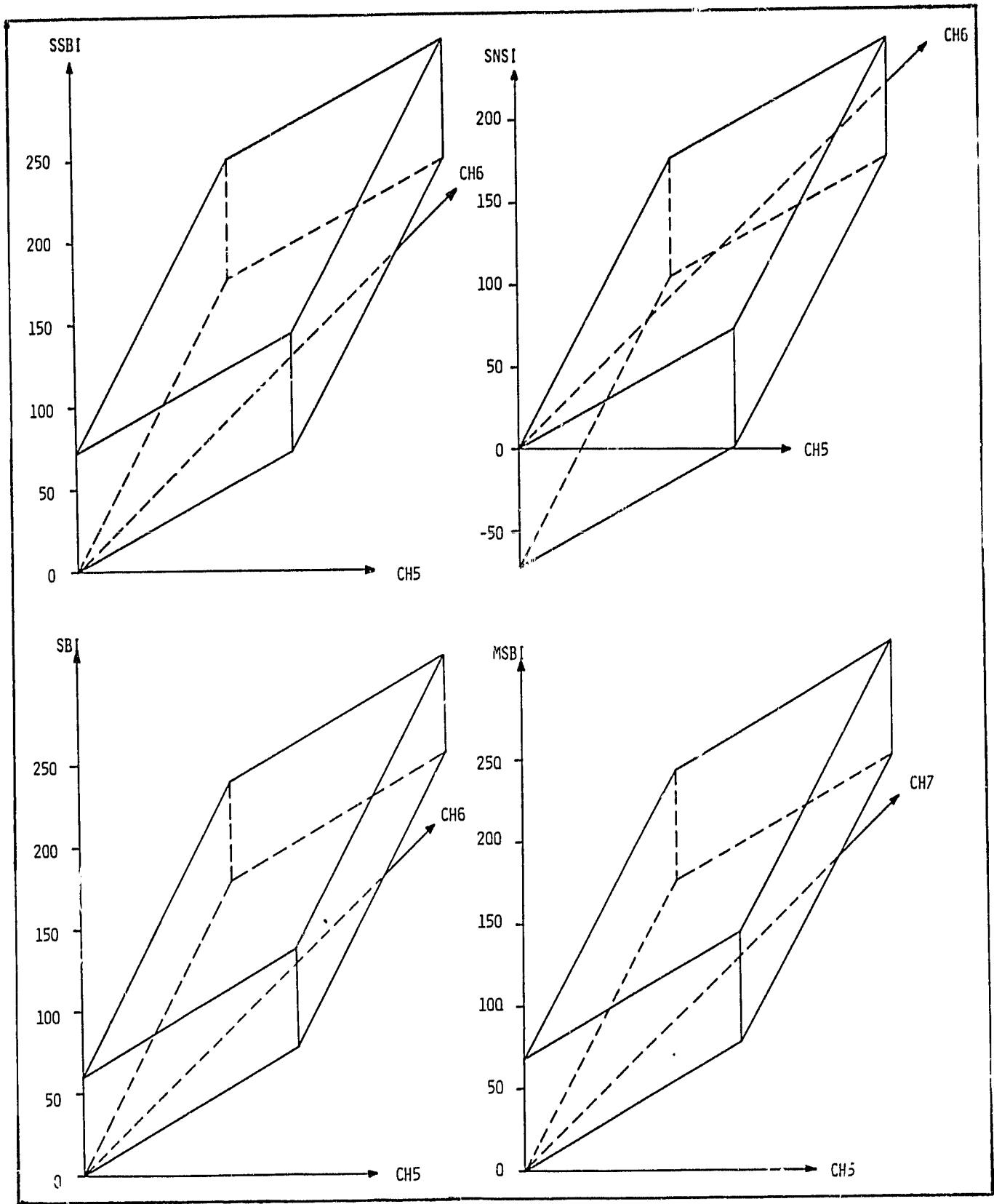
APPENDIX C

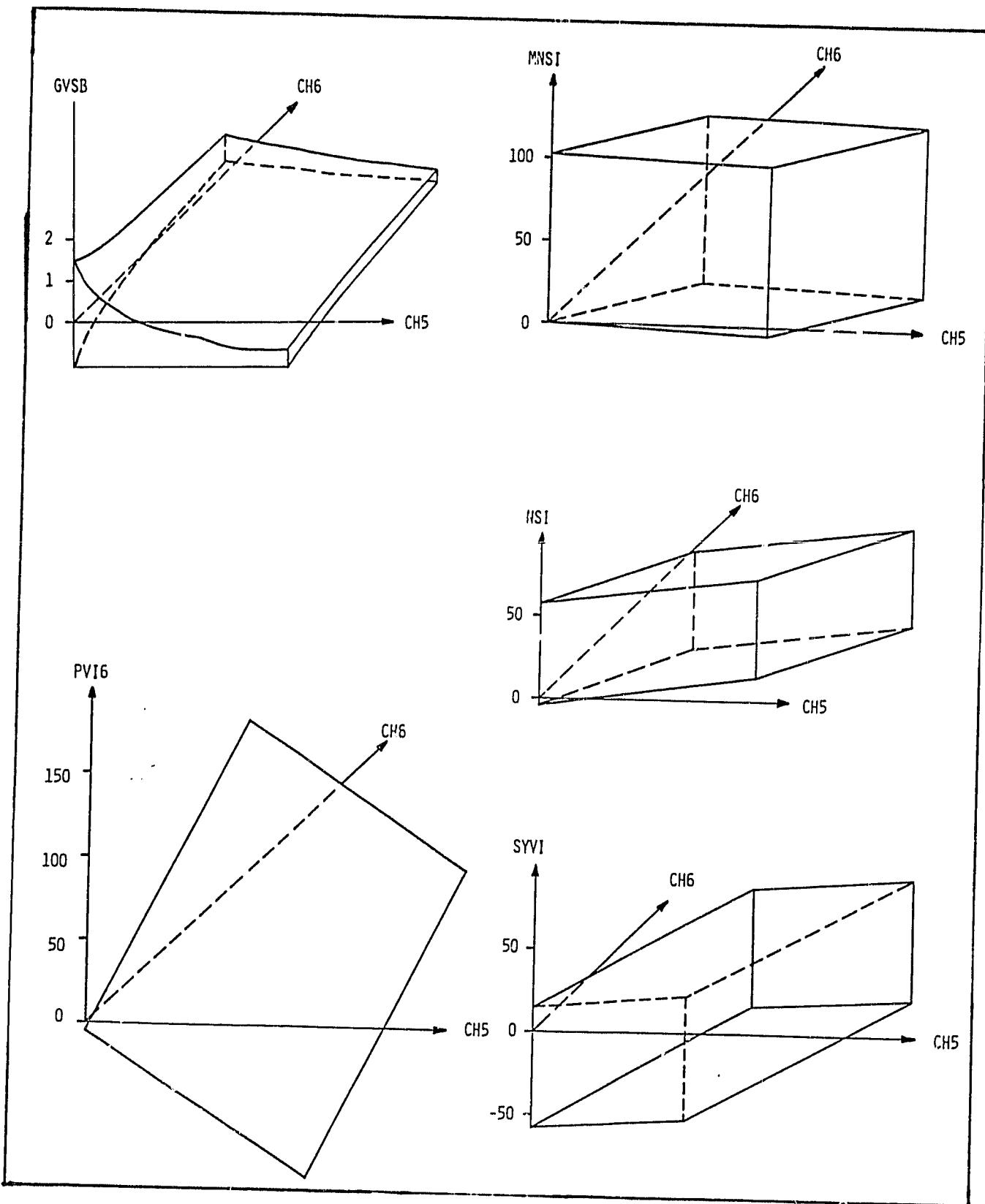
GRAPHICAL REPRESENTATION OF VEGETATION INDICES

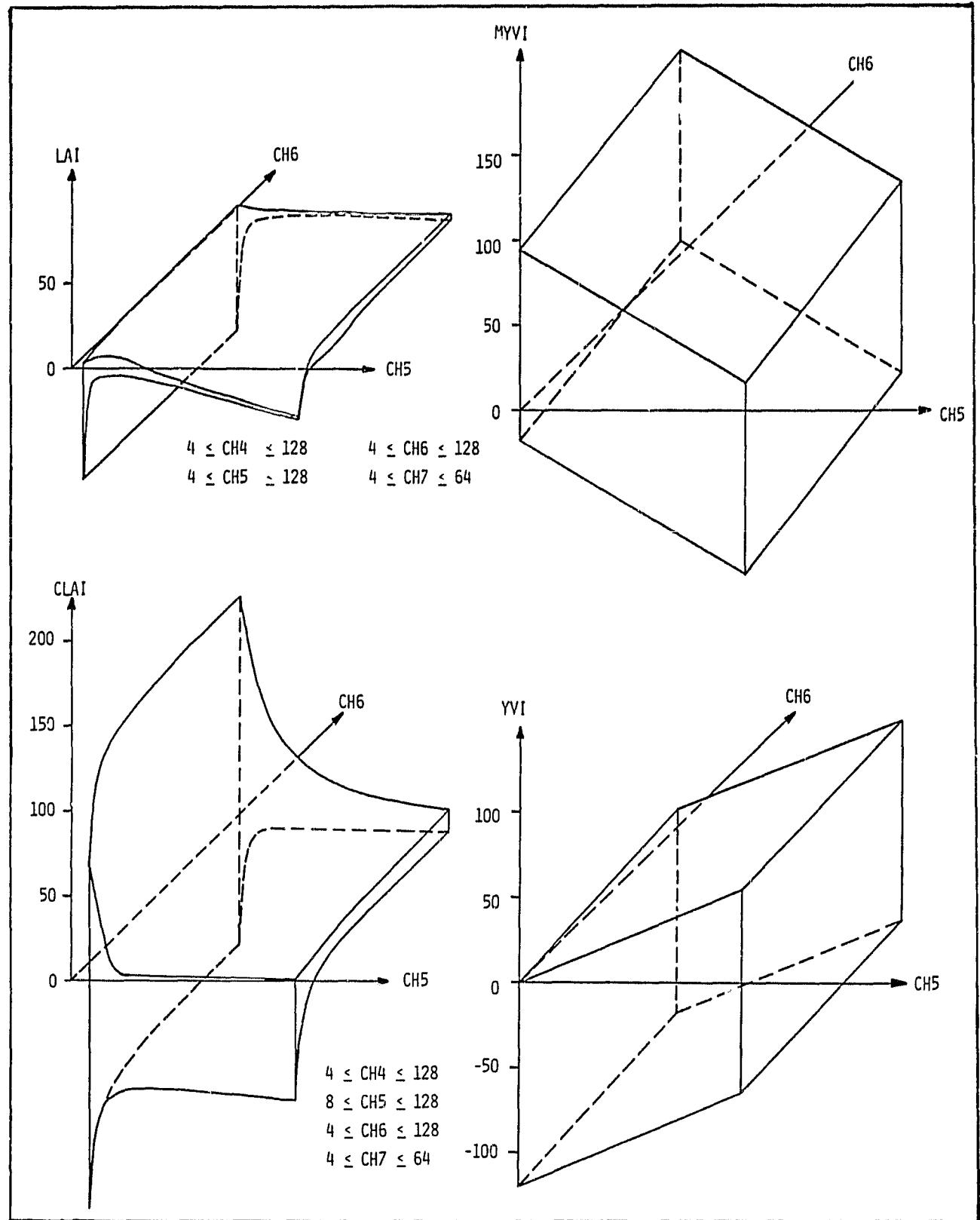
Part 2. Generalized representation of VIs involving more than two MSS channels.

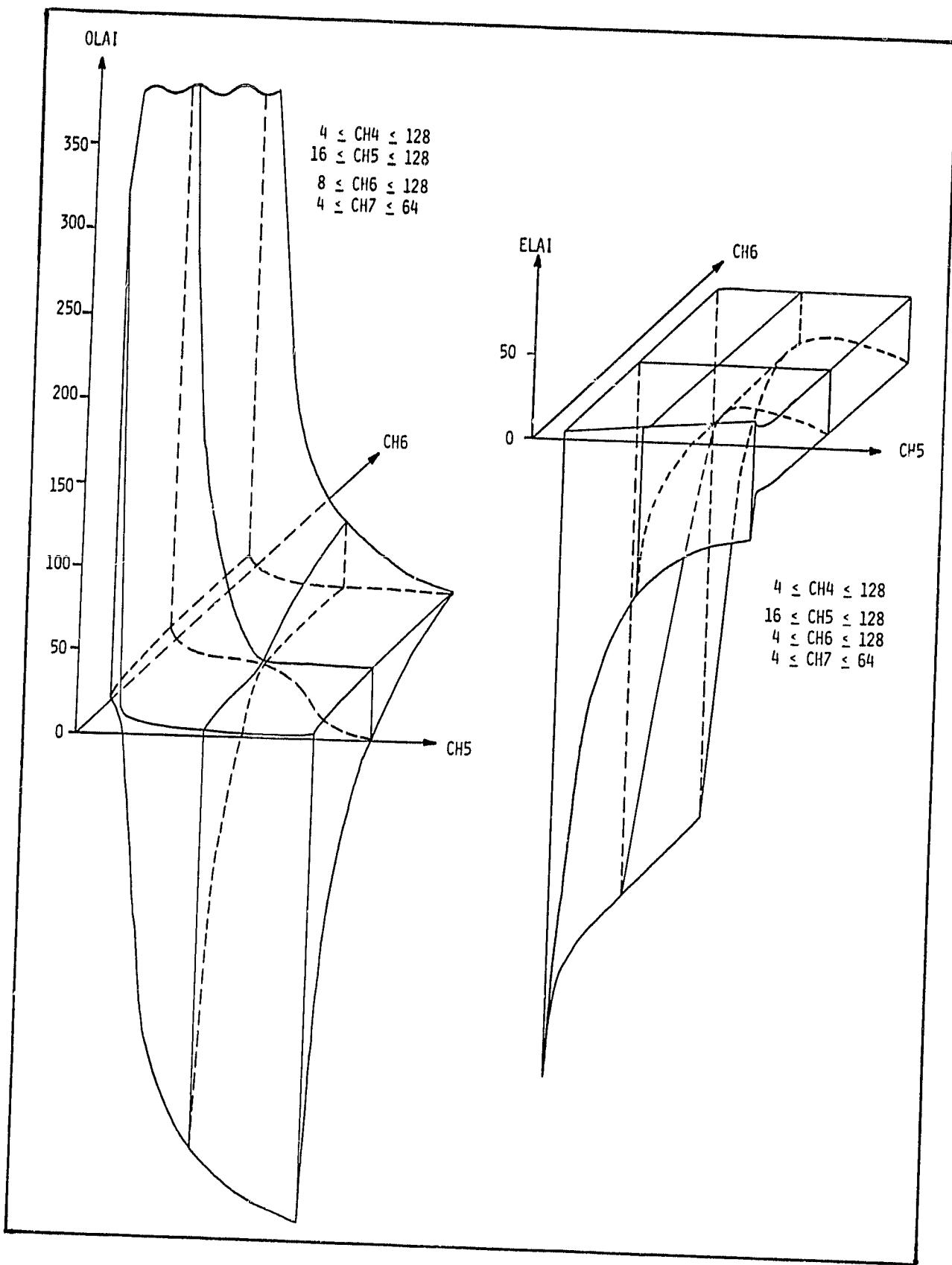
Representation in 3 dimension of vegetative indices involving more than two MSS channels is not possible. However, insight into this behavior is obtained by studying their range as a function of two MSS channels. In these graphs, the VI's range is represented on the vertical axis for fixed two-dimensional subsets of the MSS data. Care should be used in interpreting these graphs, and consideration should be given to the high correlations that are known to exist between (CH4 and CH5) and (CH6 and CH7). Even with these limitations, these graphs show the close relationship between the soil brightness components and greenness components of the Kauth-Thomas and the two Misra-Wheeler transformations.

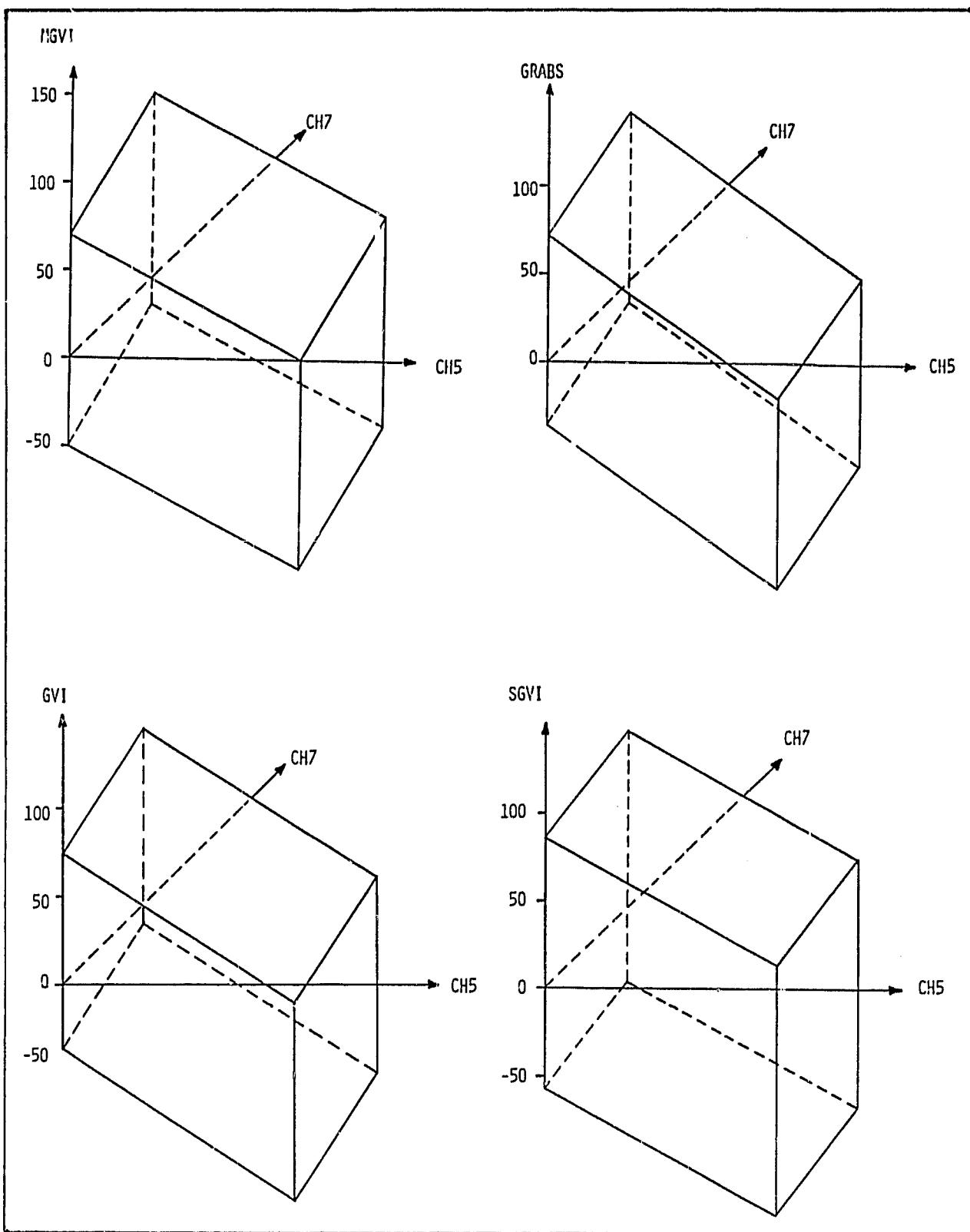


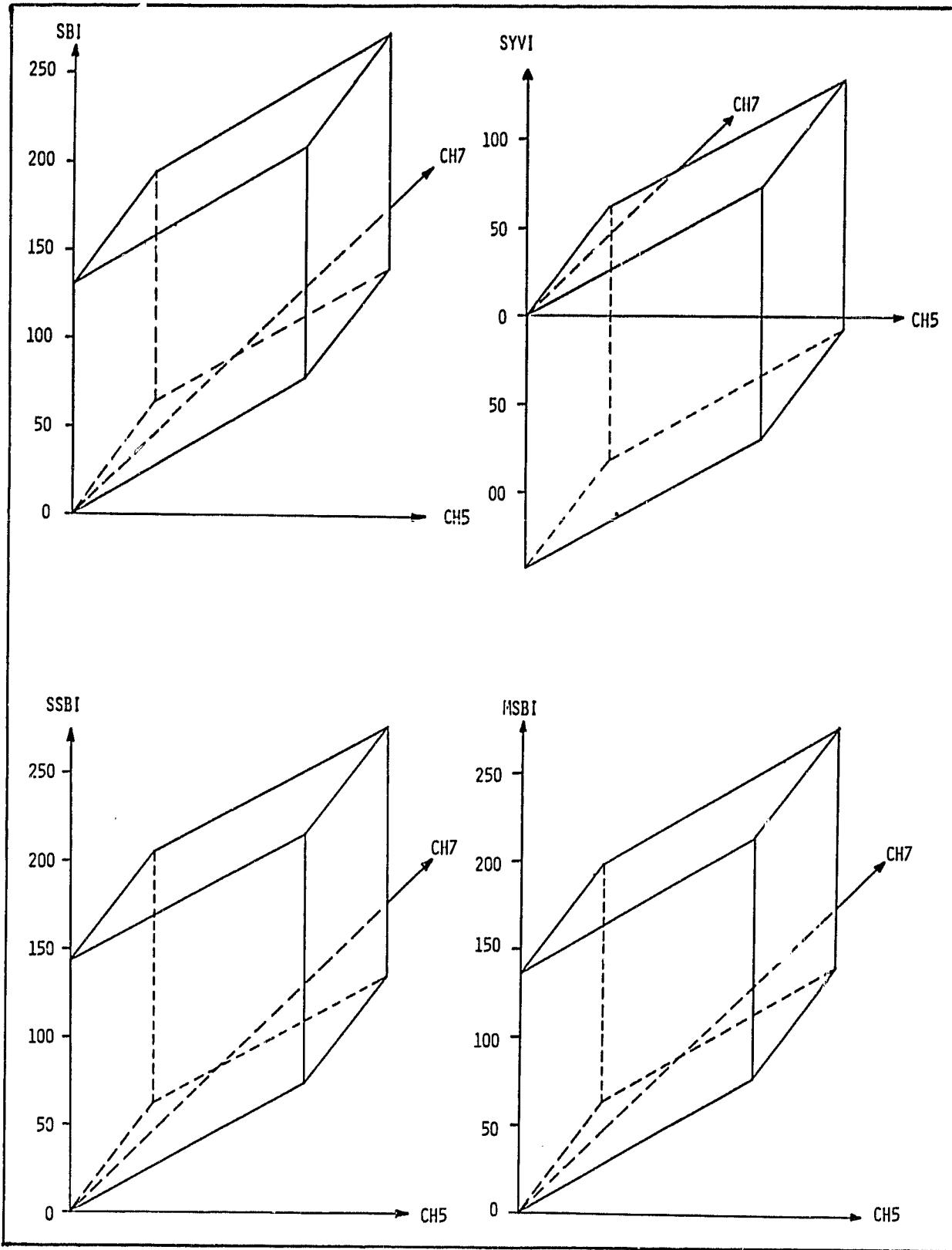


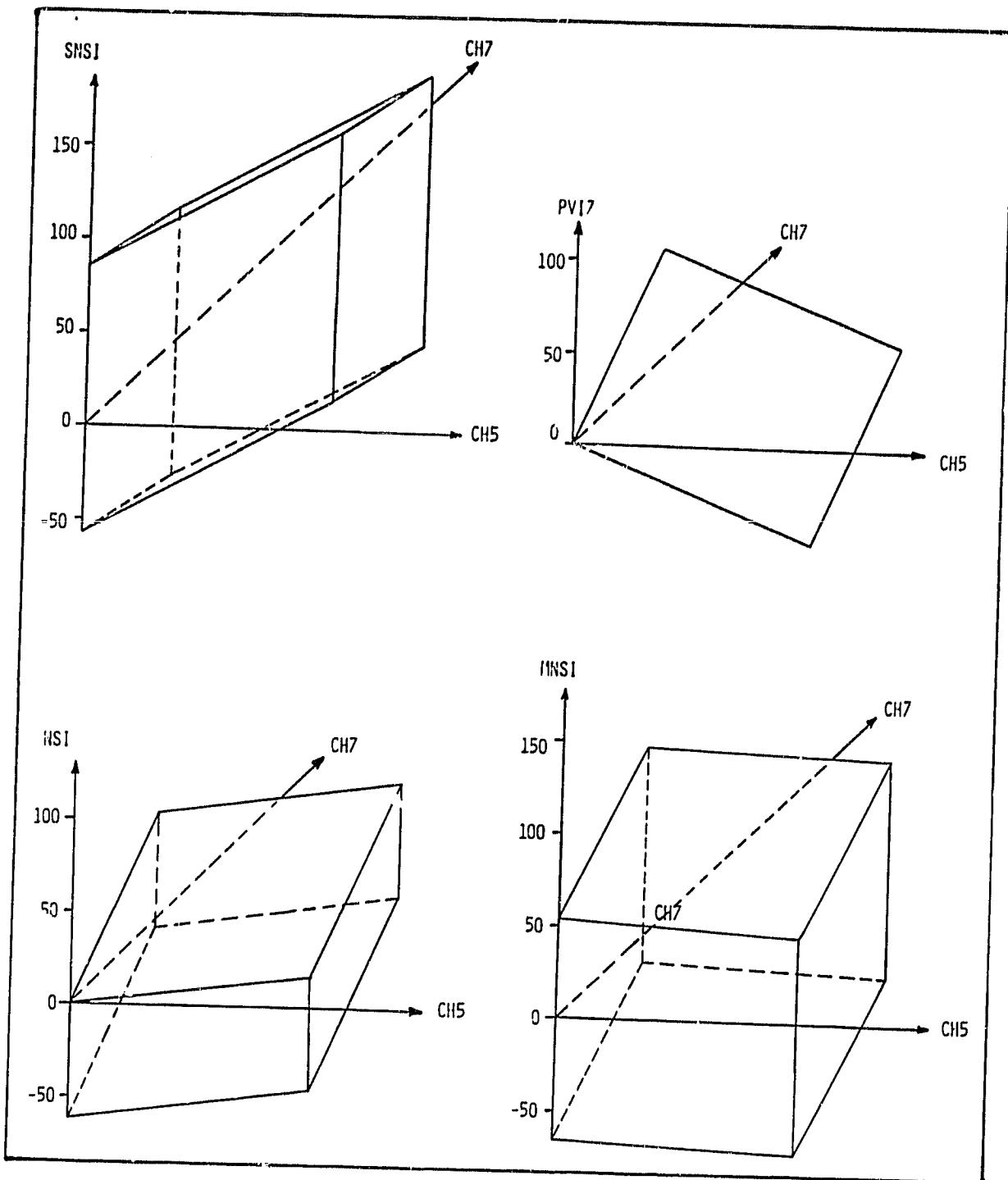


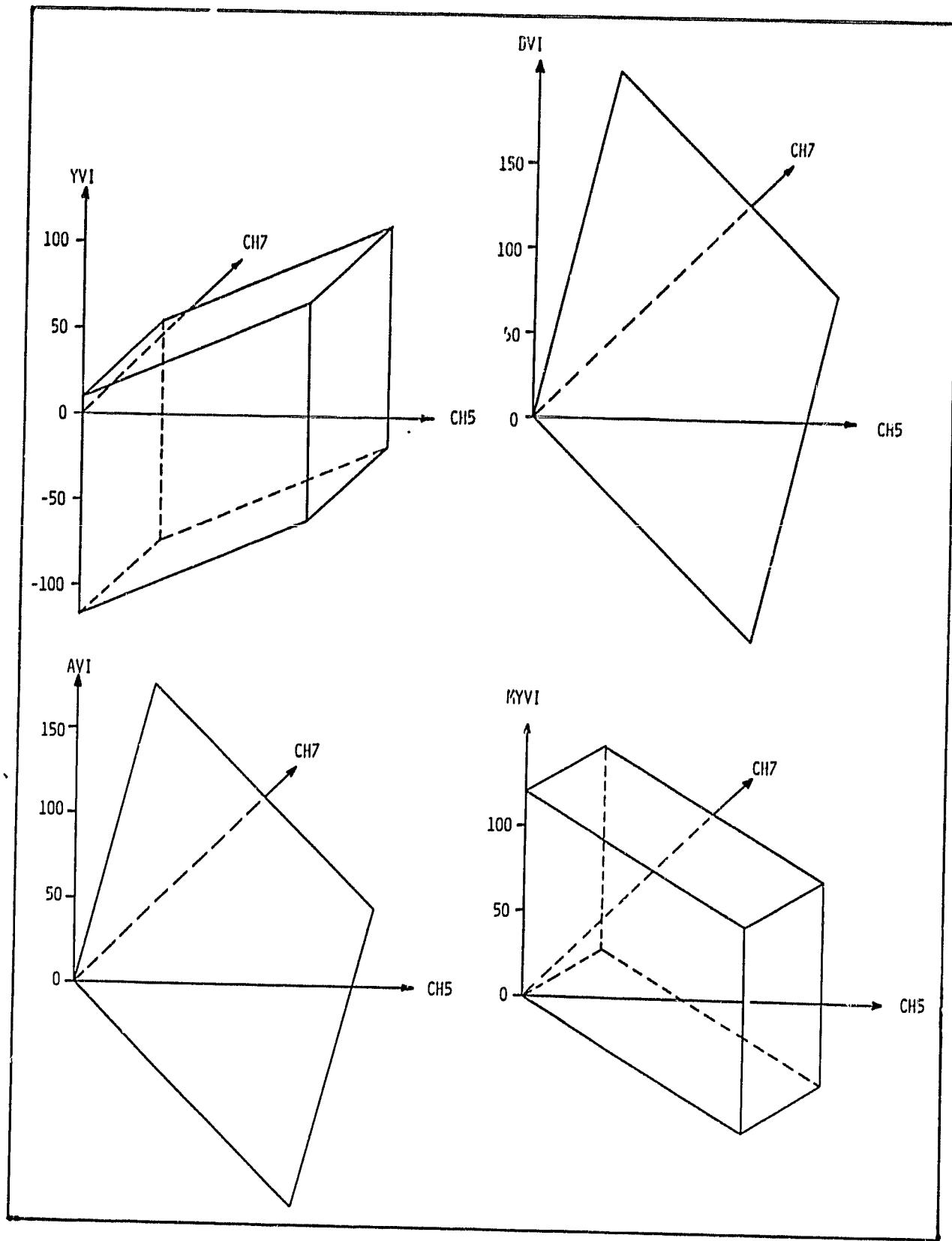












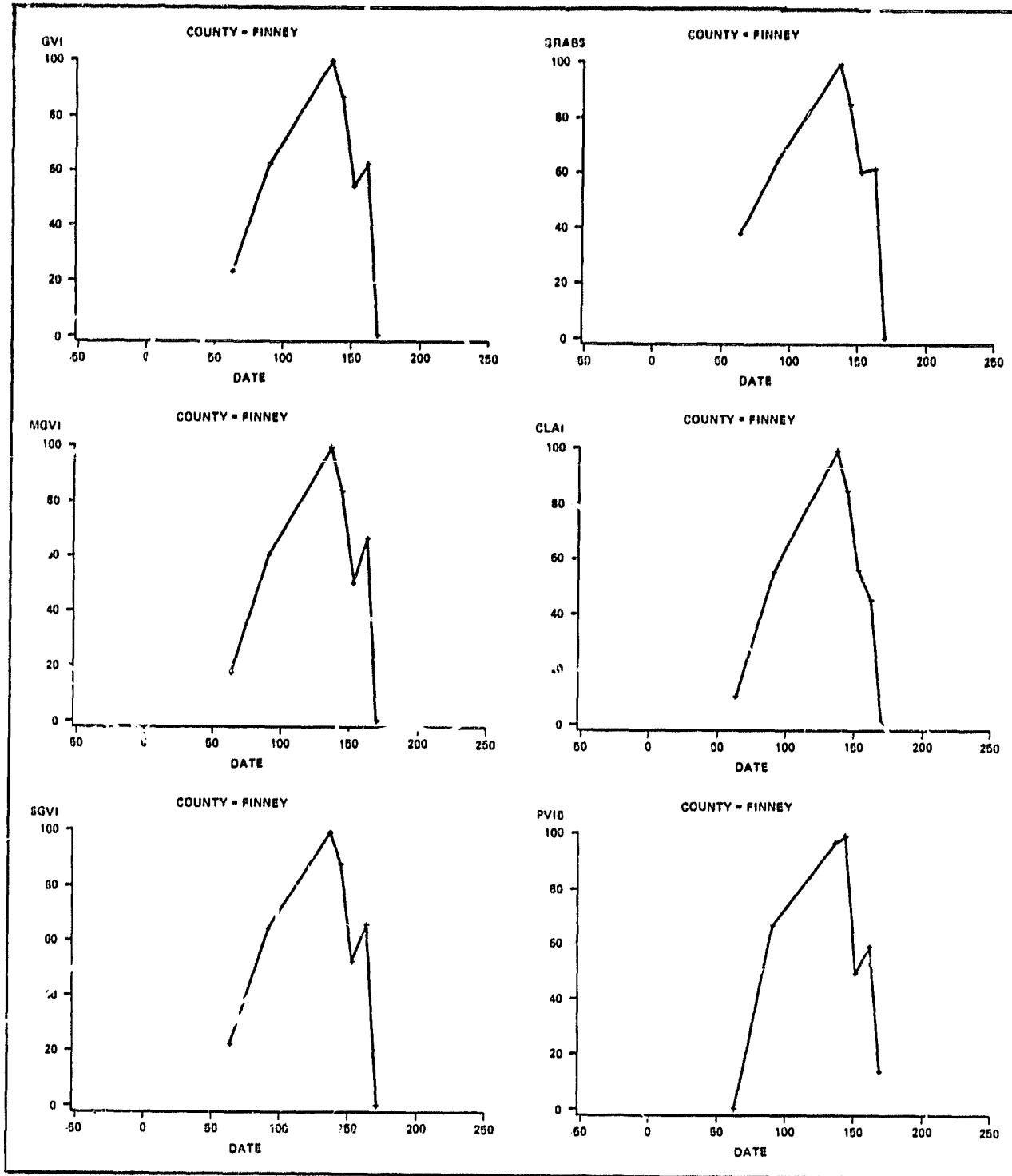
APPENDIX D

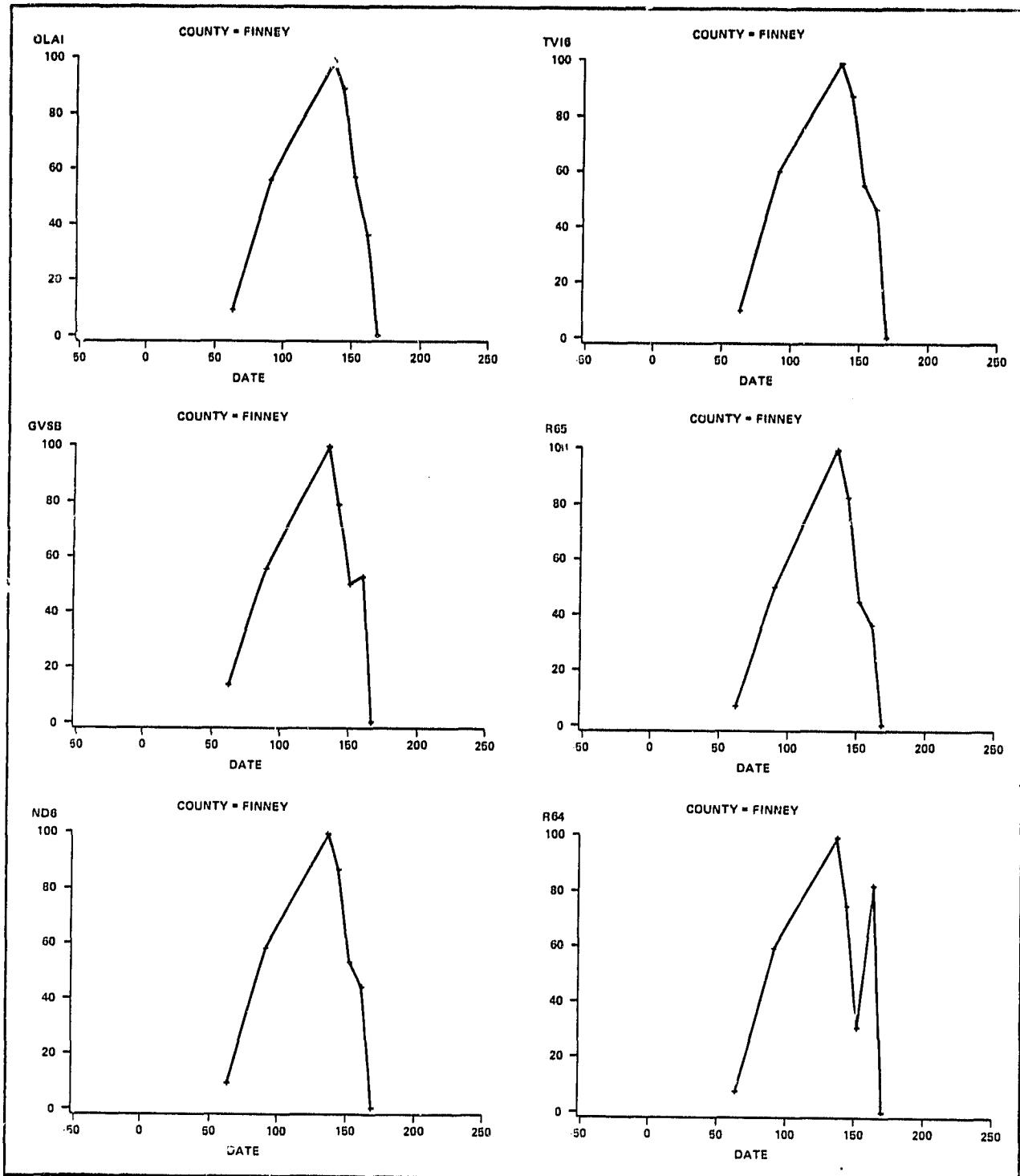
VEGETATION INDICES TRAJECTORIES

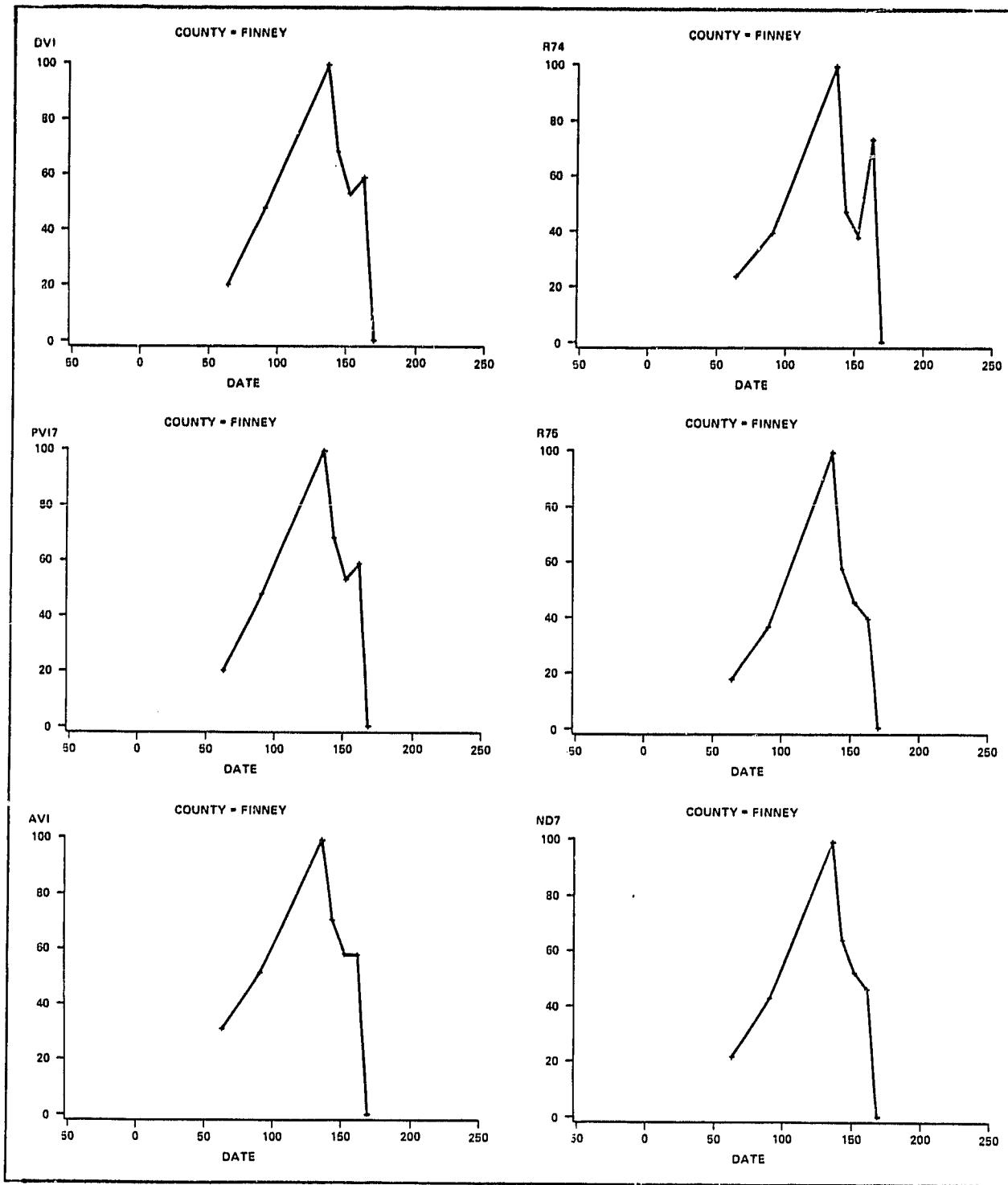
It is well known that two quantities may be functionally related and yet have zero linear correlation. This possibility was studied by graphing VIs over time. All VIs were rescaled to range from 0 to 100 to facilitate interpretations.

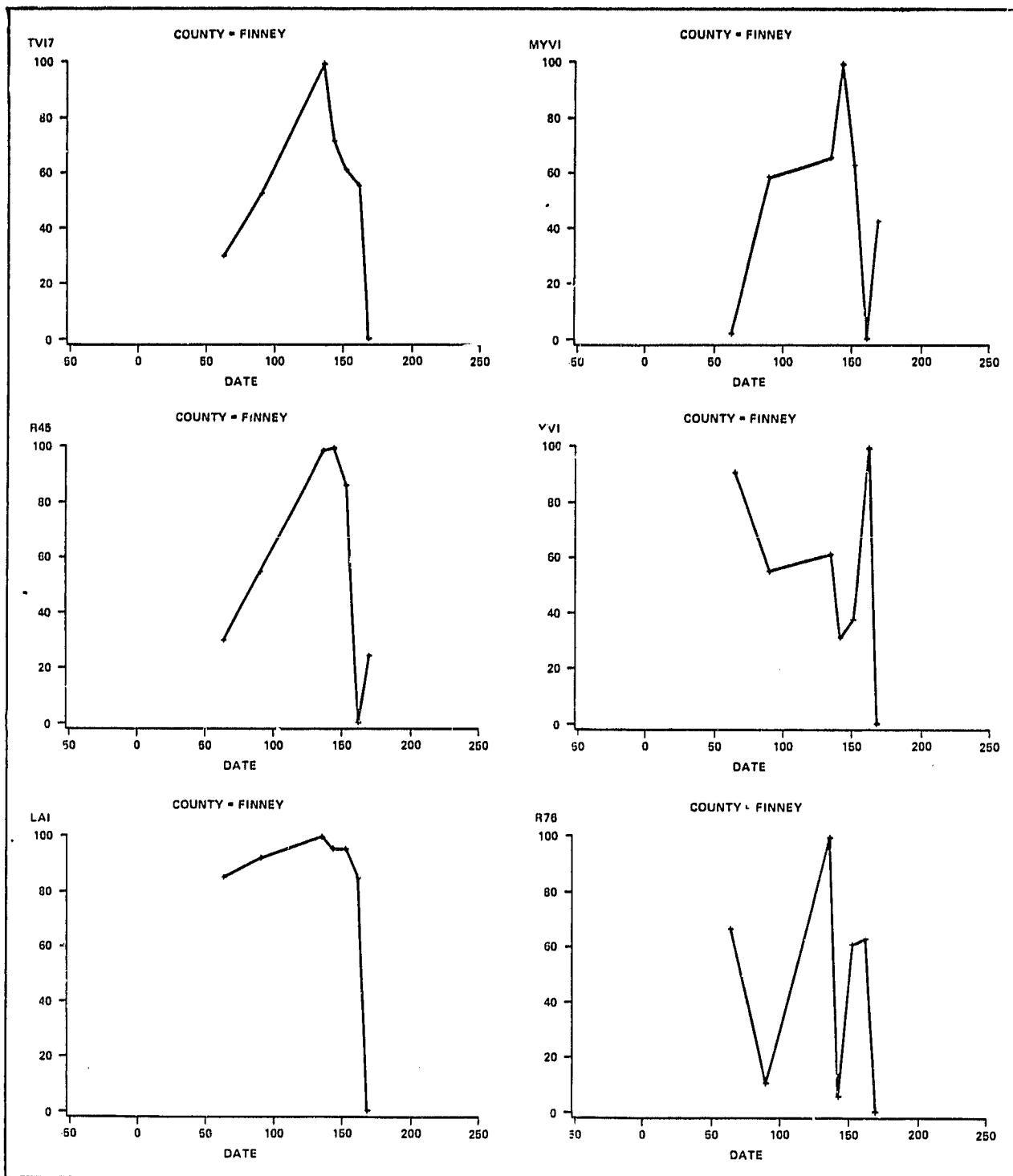
This analysis revealed that some VIs were more closely related than their bivariate correlations had indicated. In some cases, the relationships appear to be close but nonlinear; in others, the correlations break down outside the period of spring greenup to harvest.

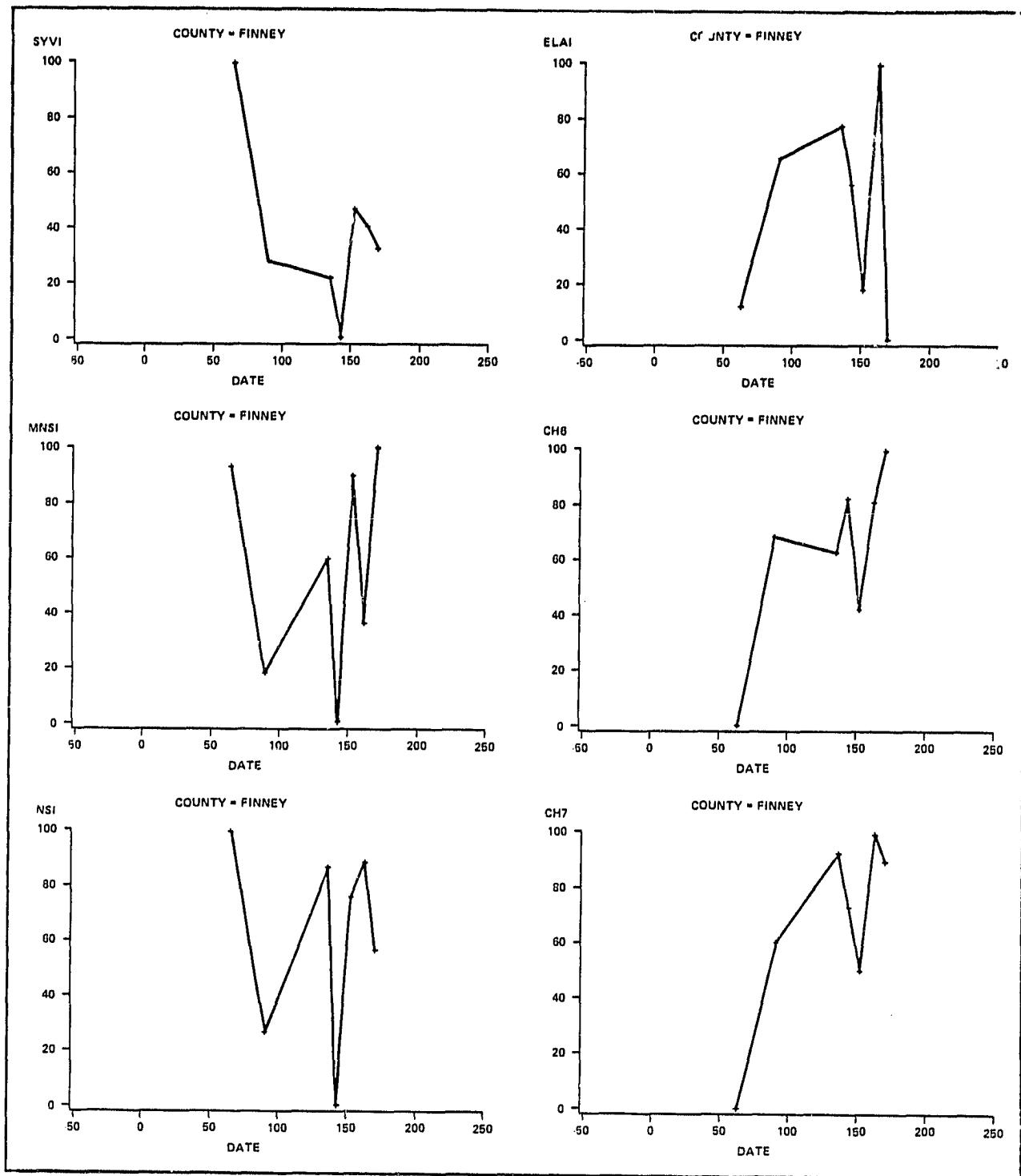
The graphs presented in this appendix are for the four sites with good acquisition histories (Yolo, Finney, Keith, and Grant counties). The trajectories are based on the field data described in Appendix A.

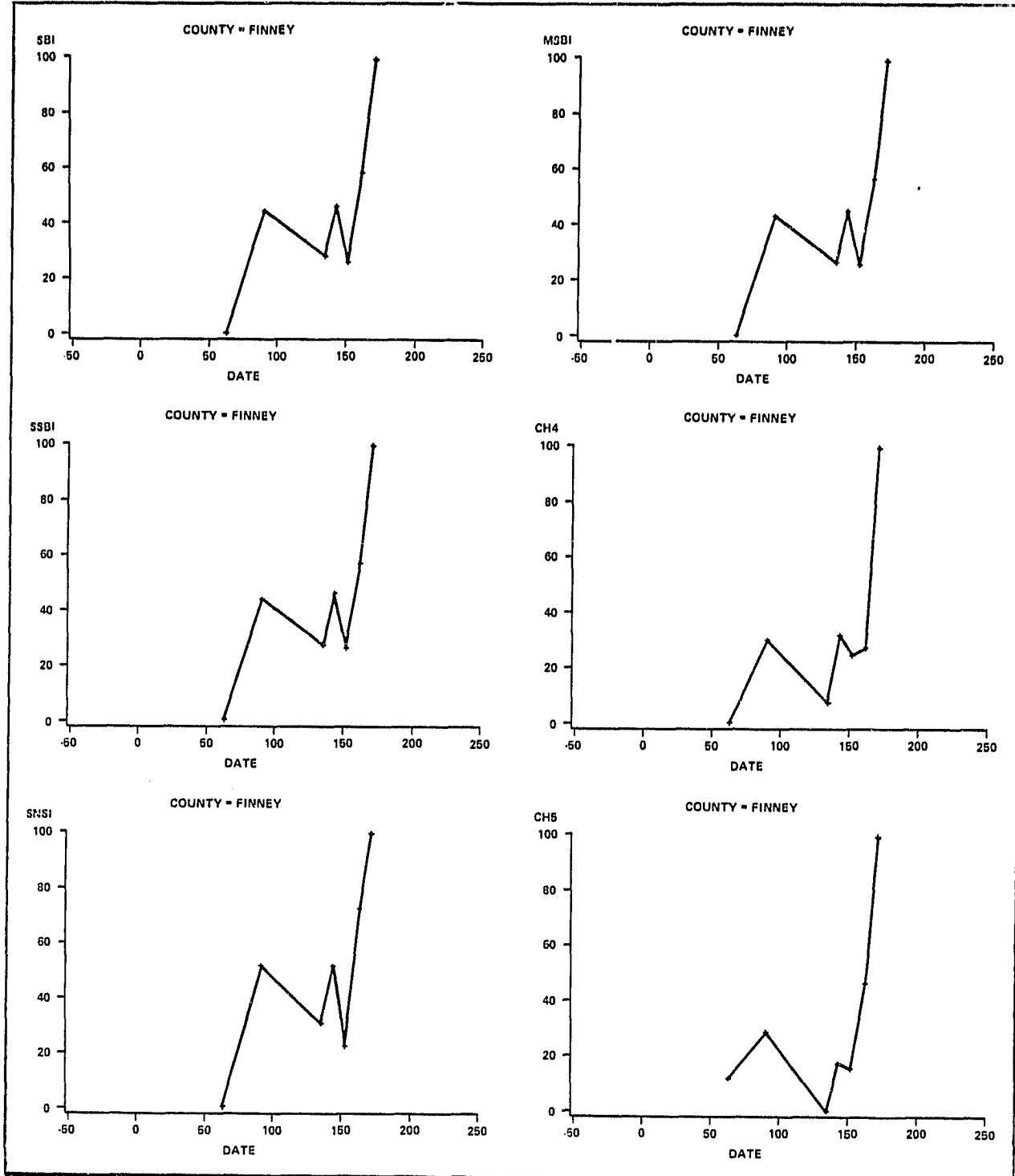


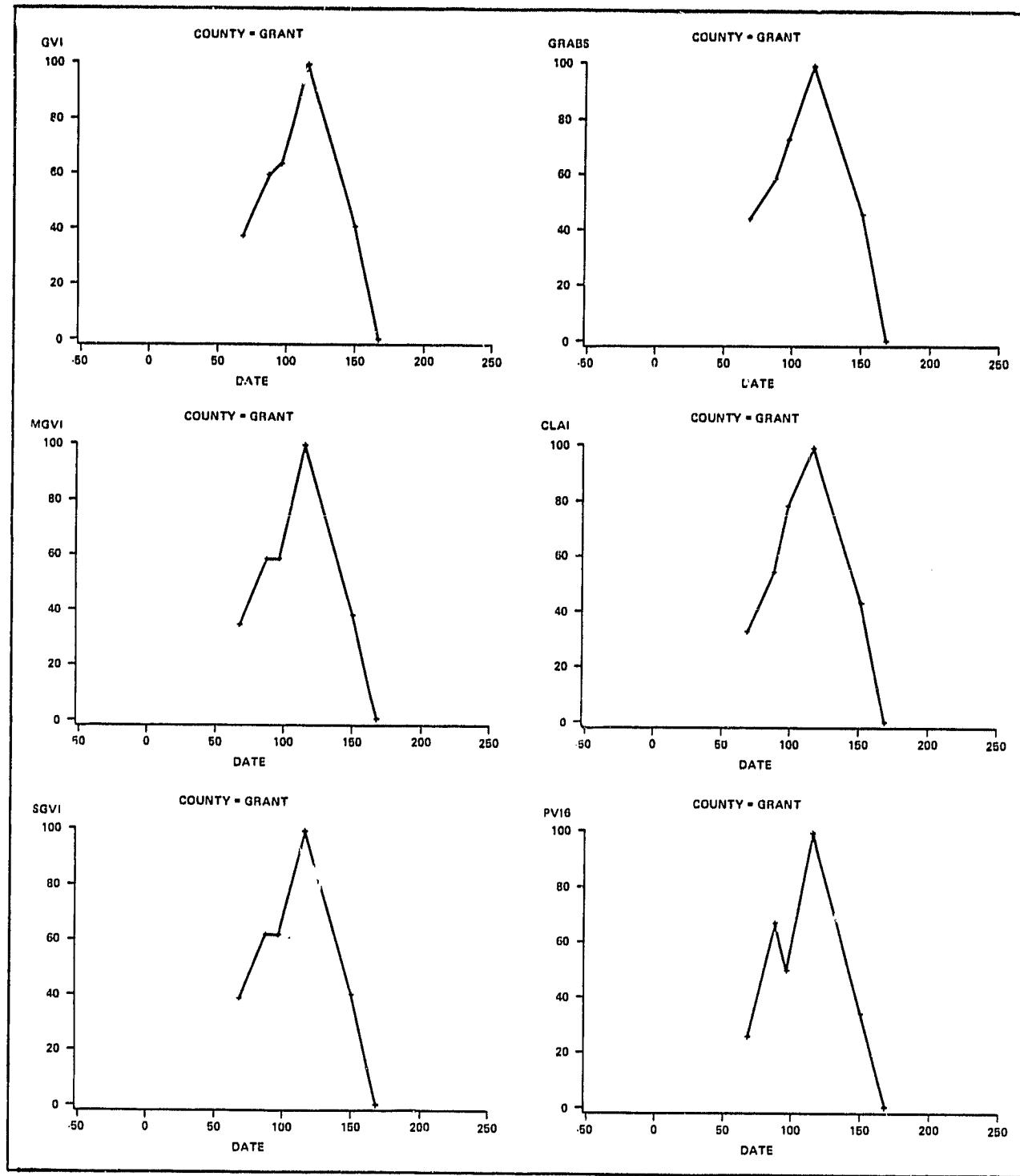


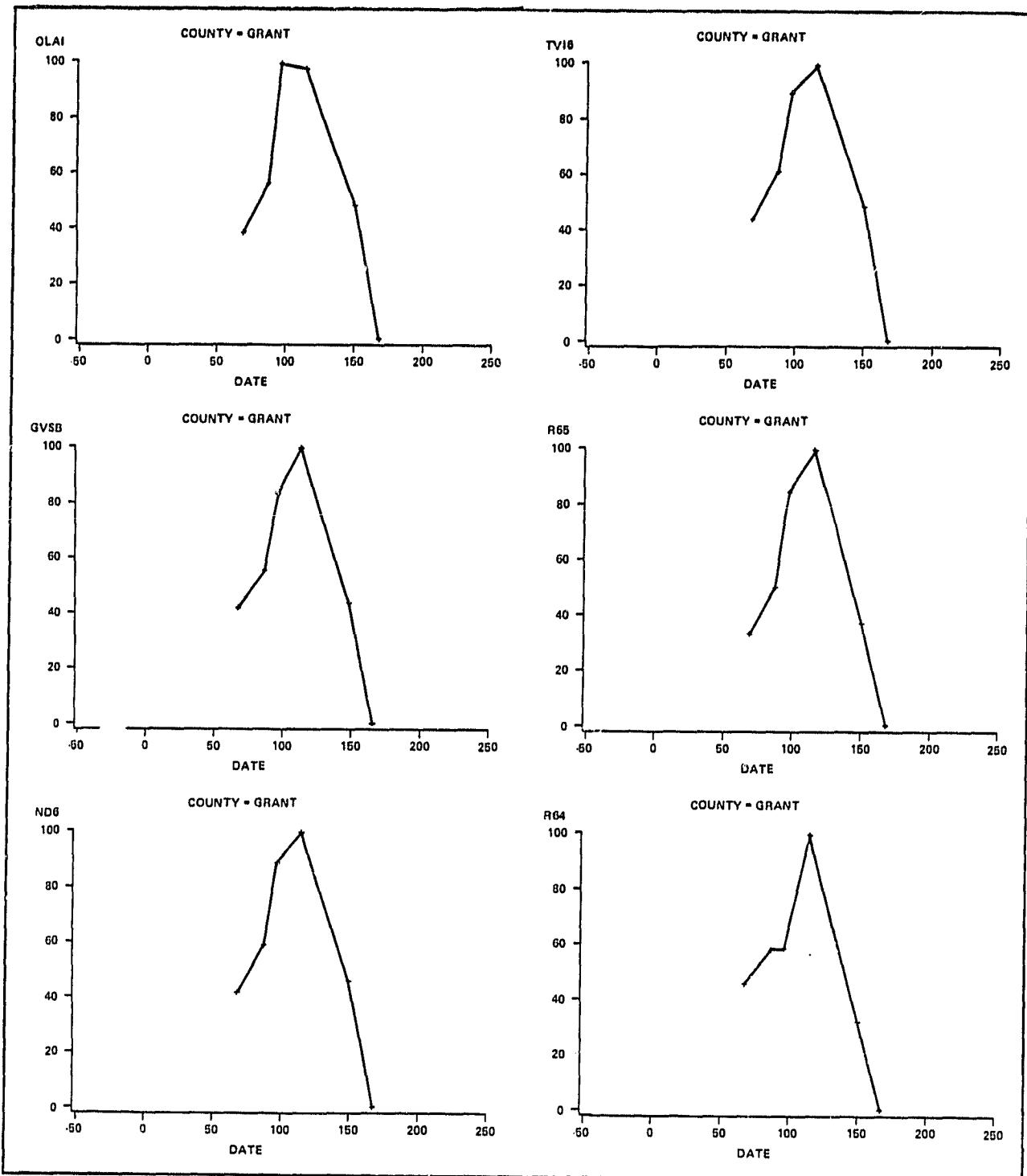


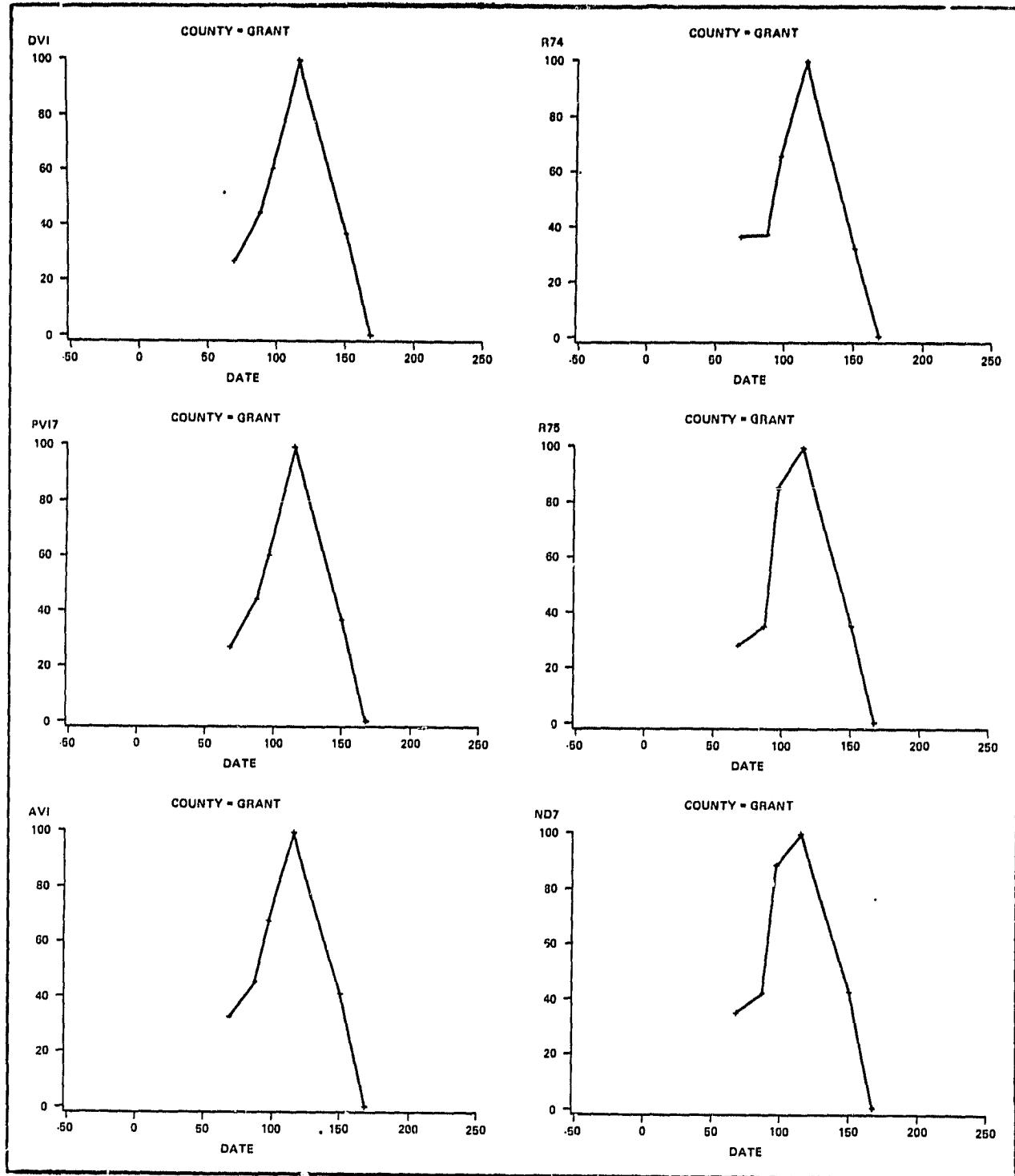


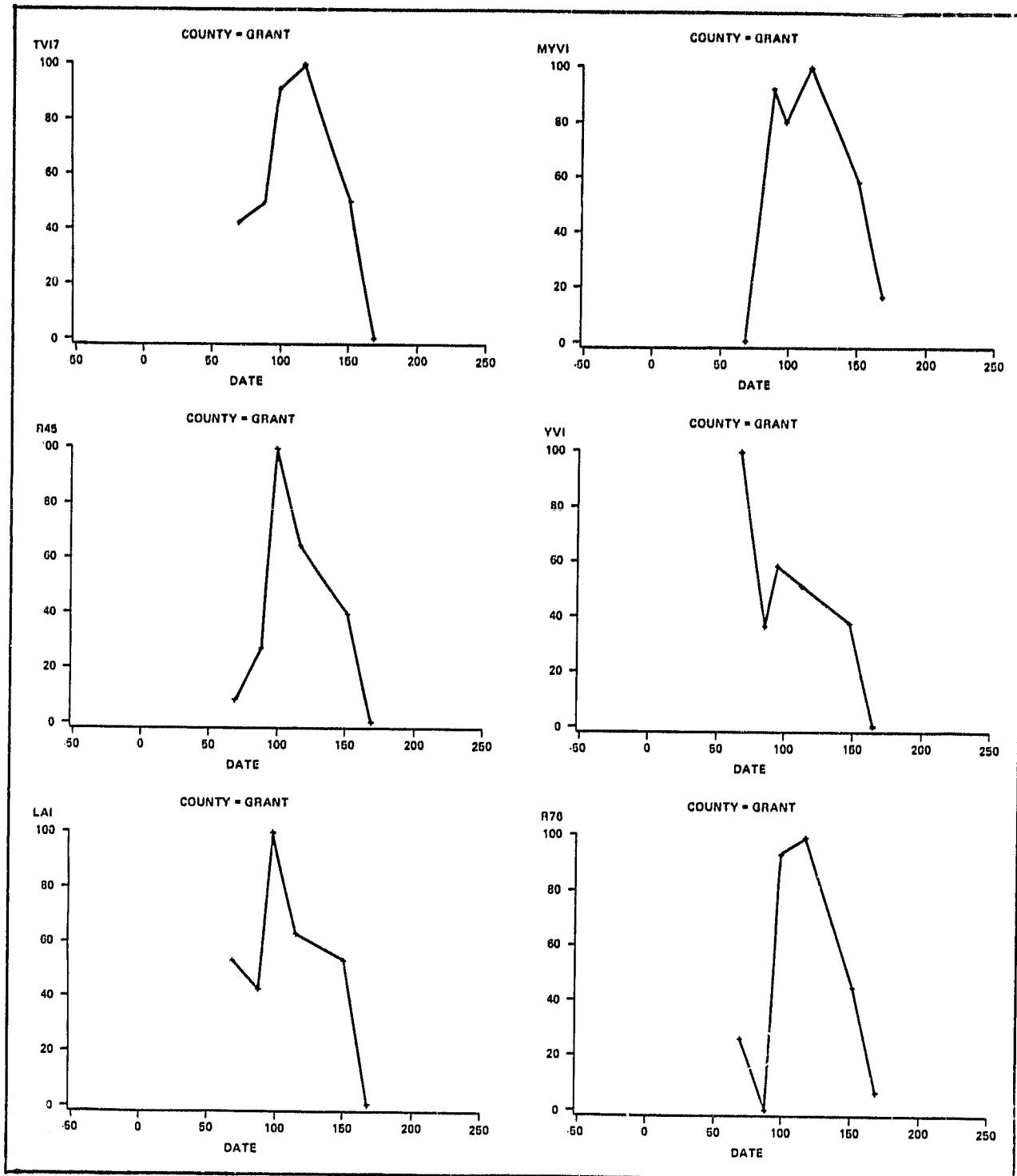


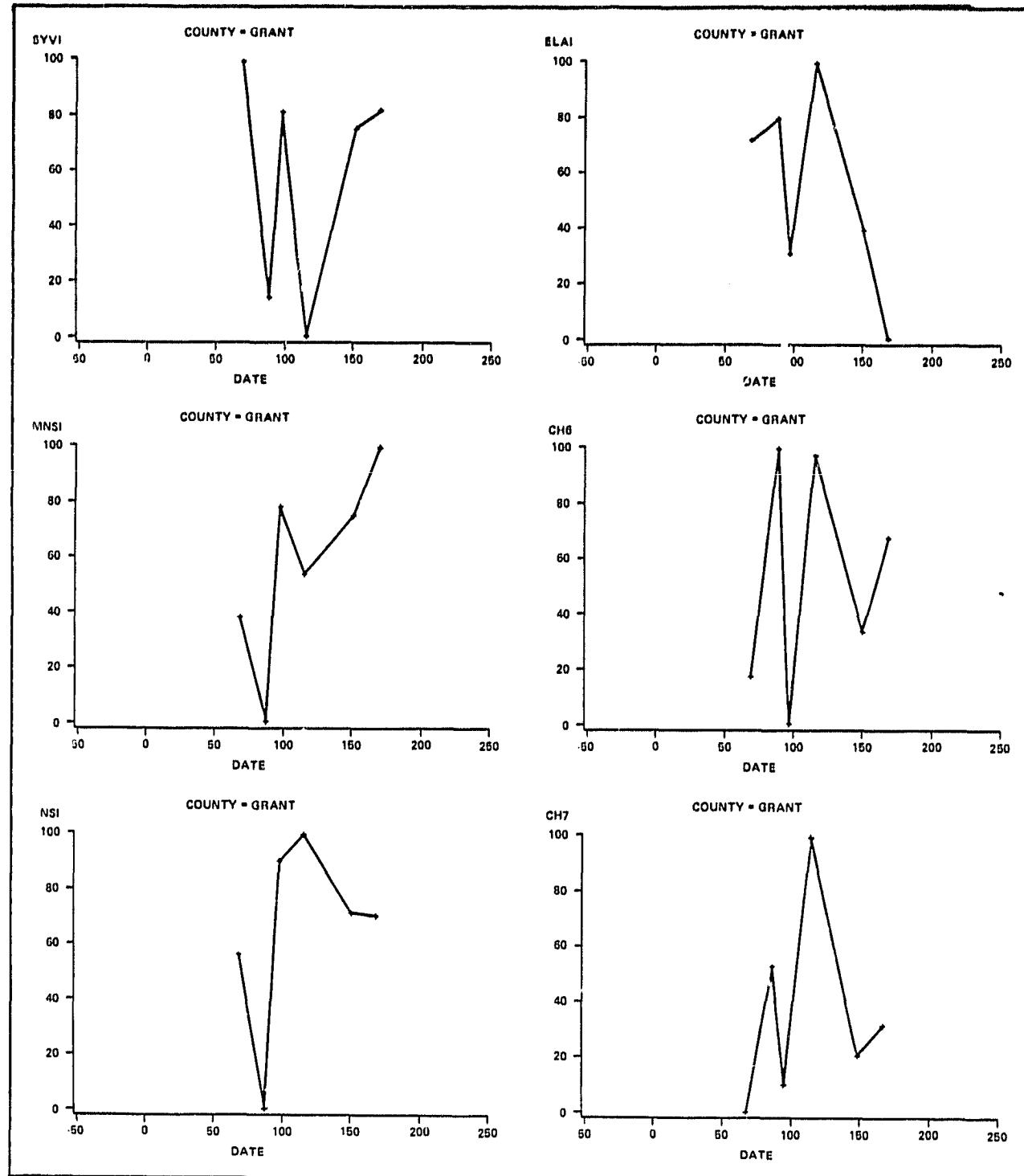


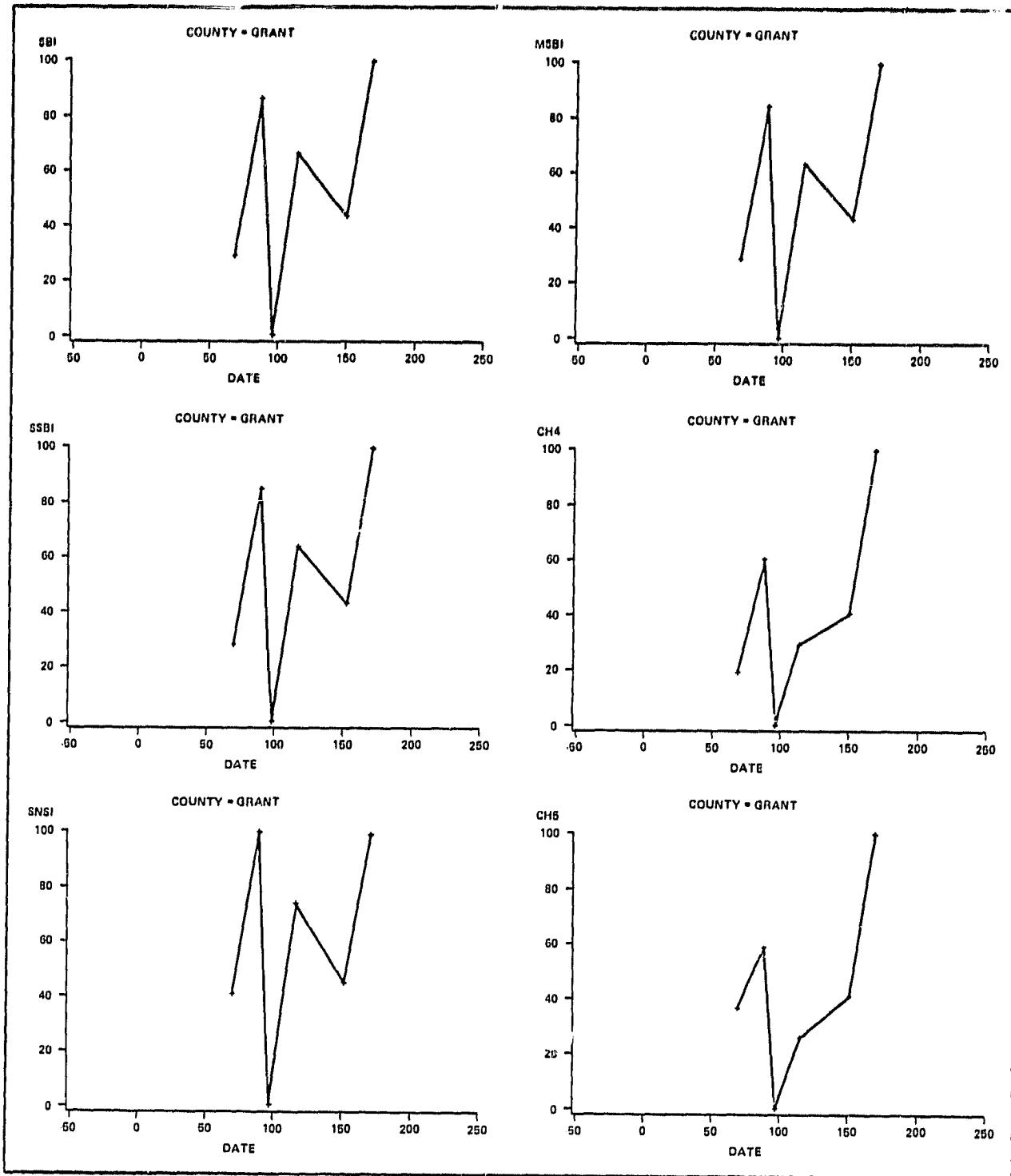


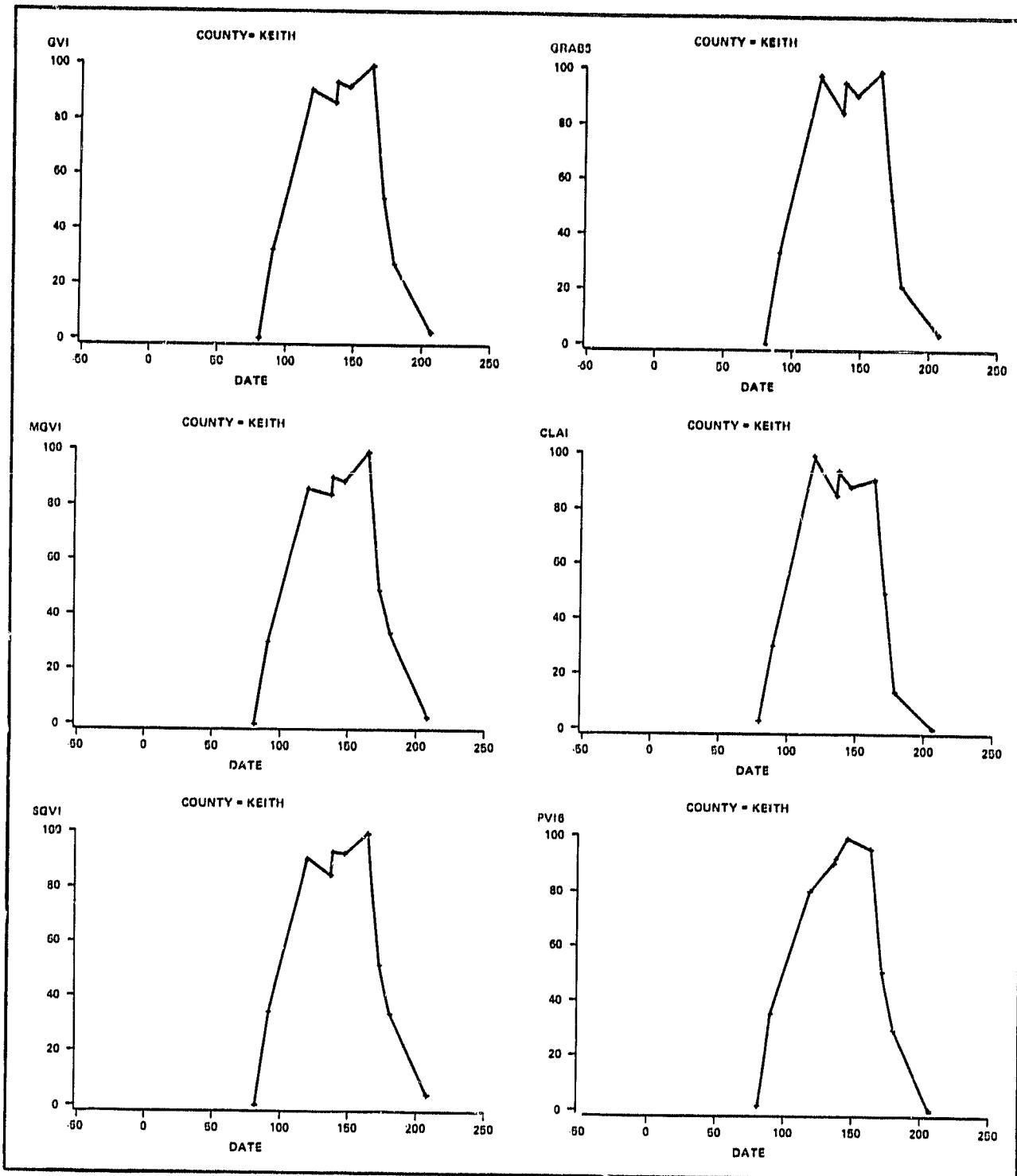


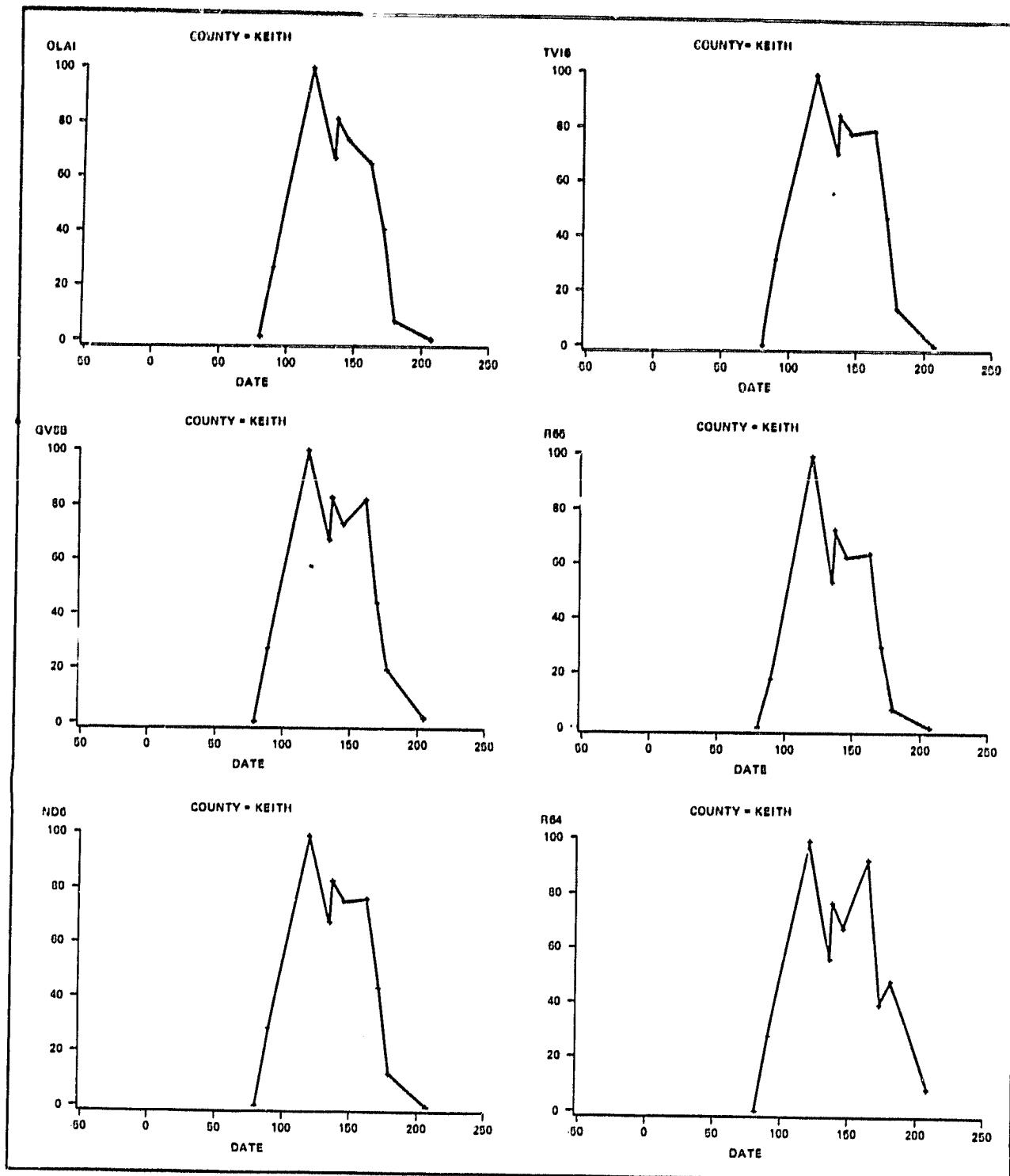


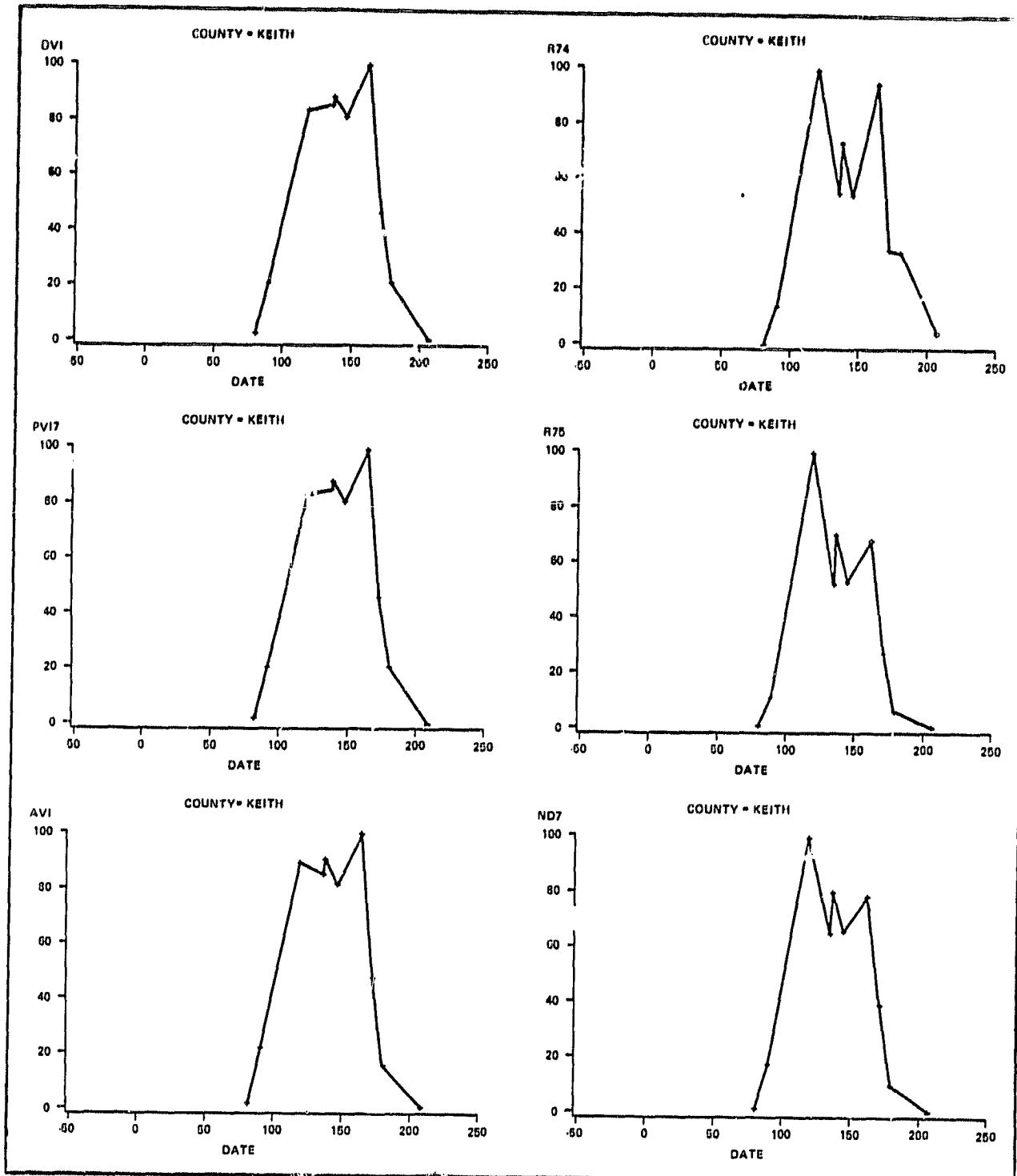


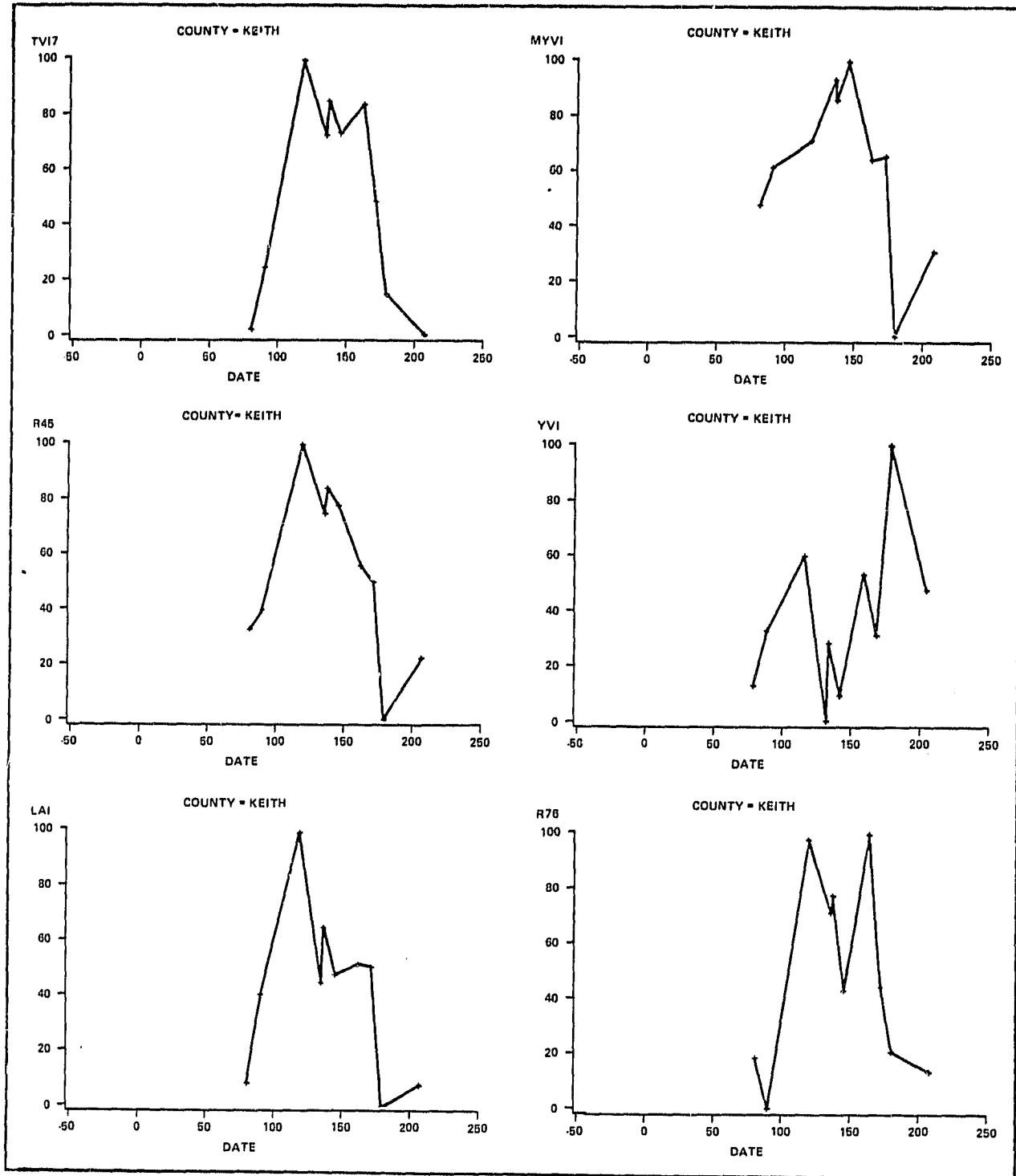


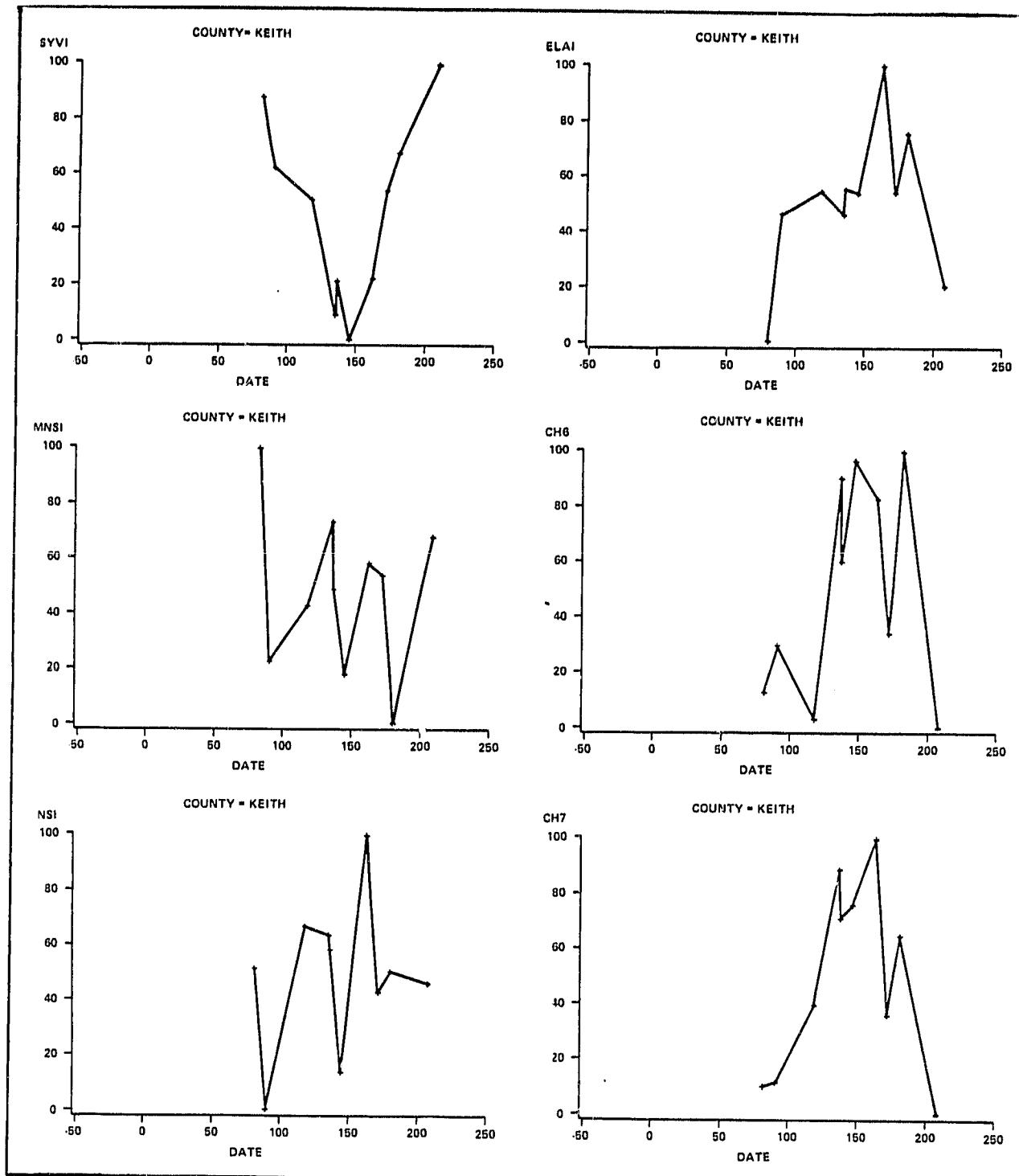


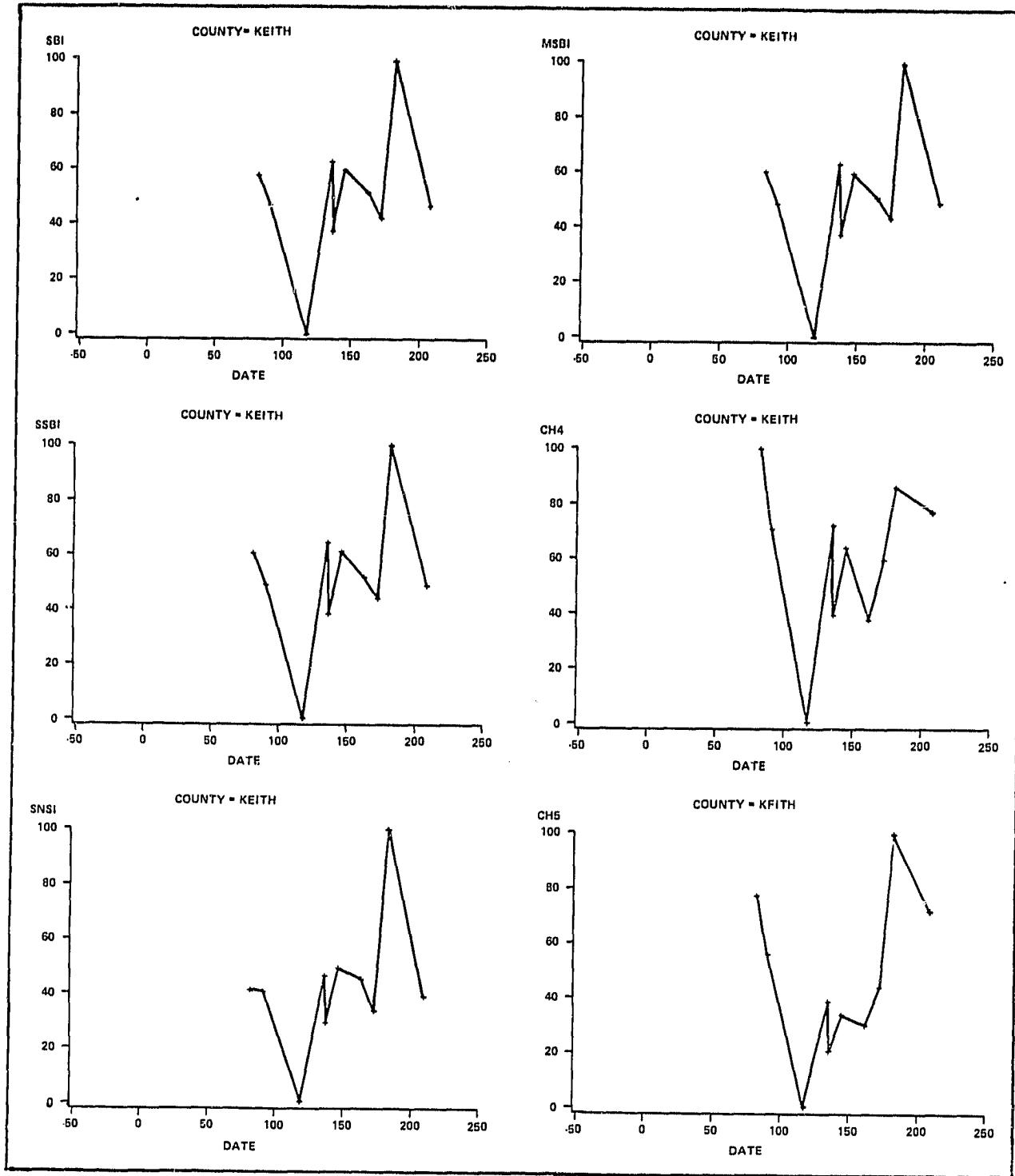


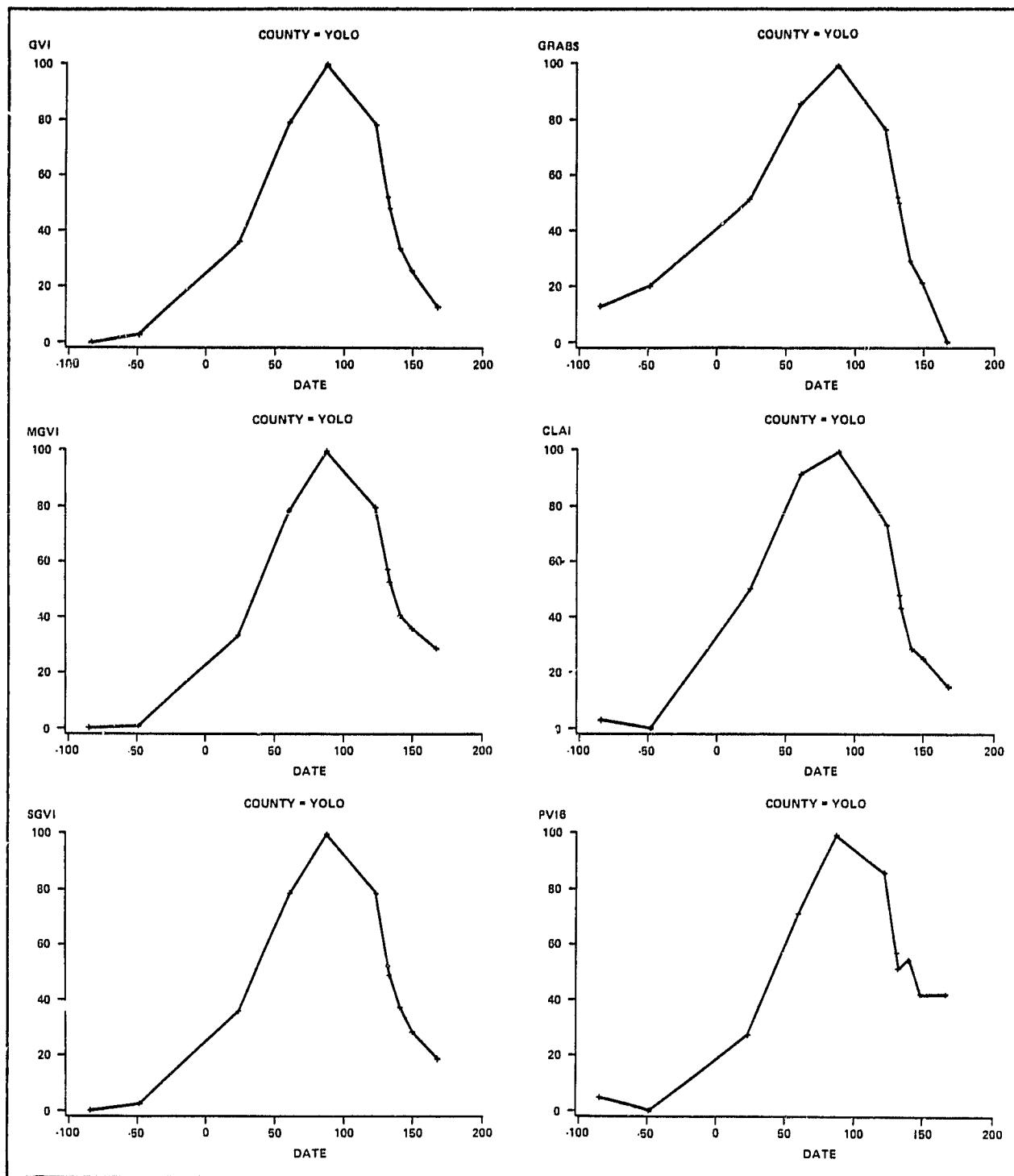


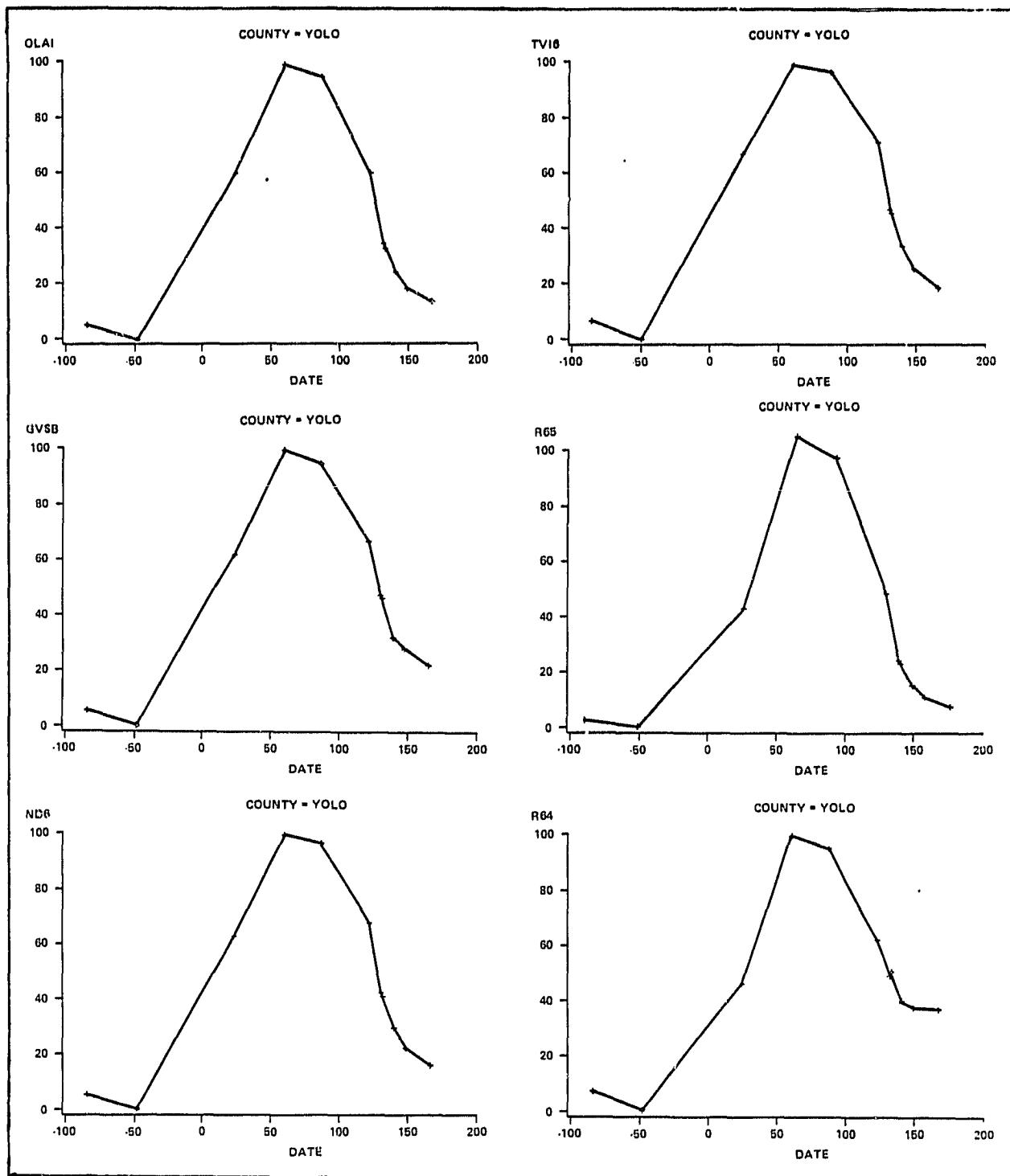


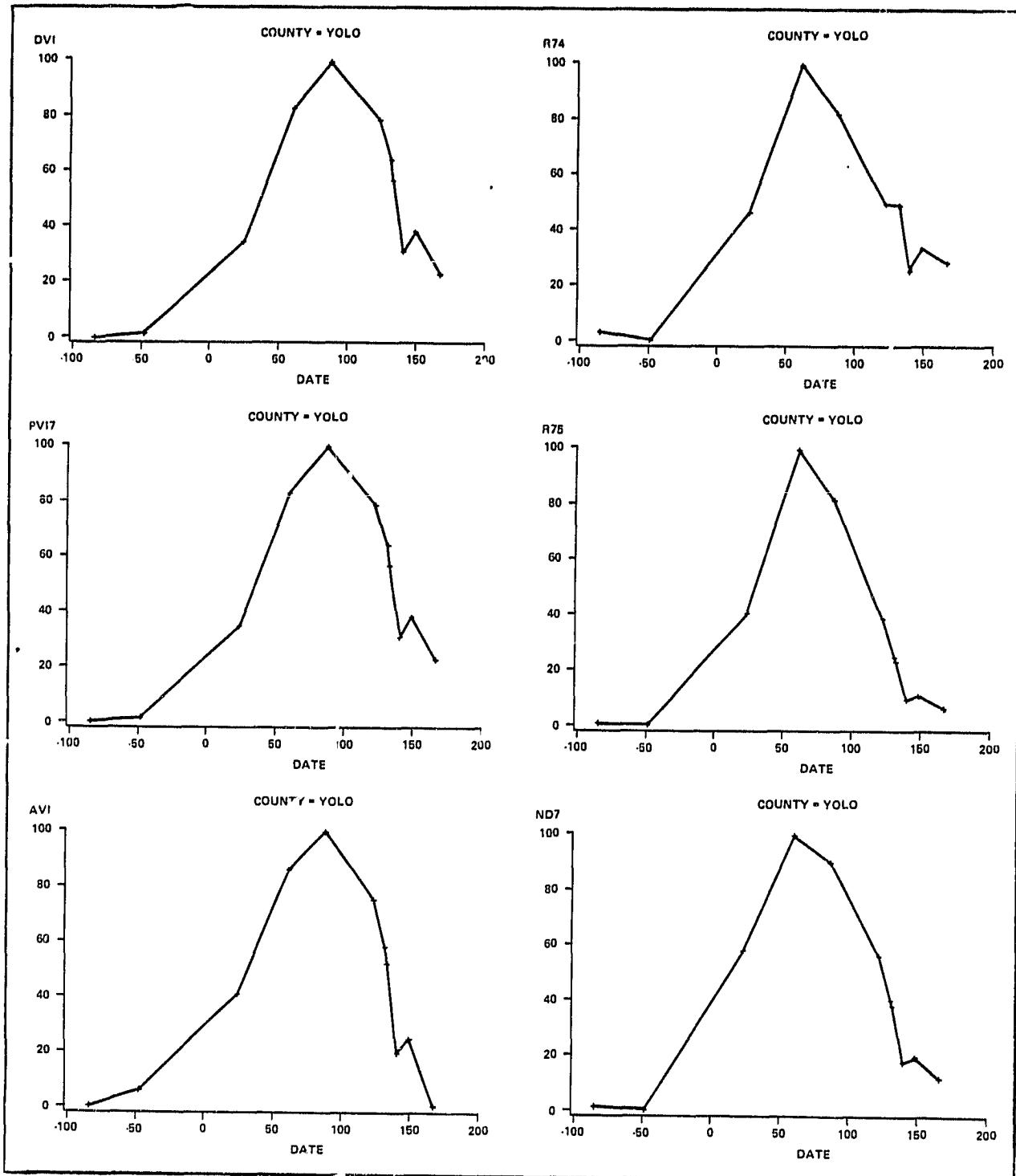


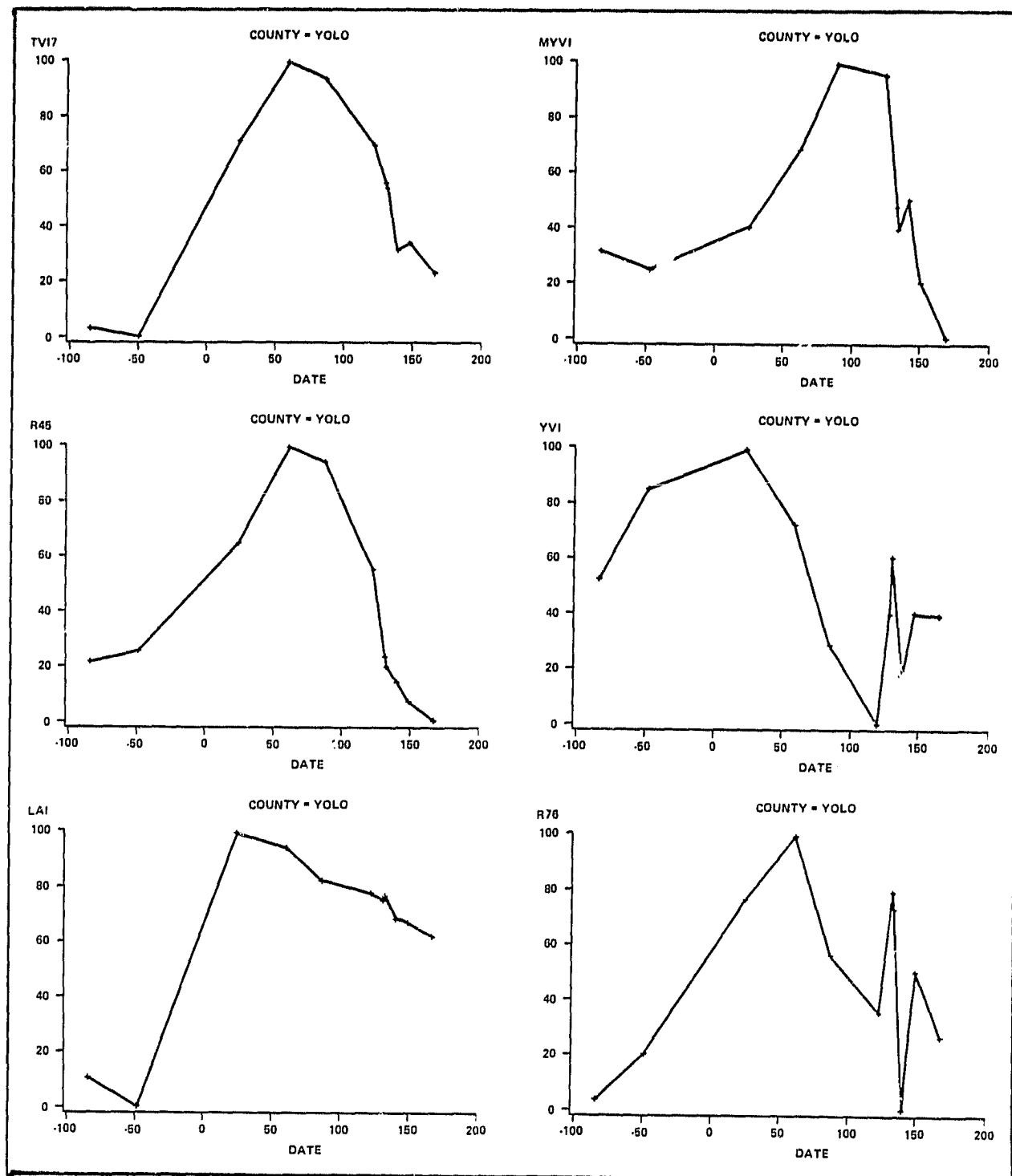


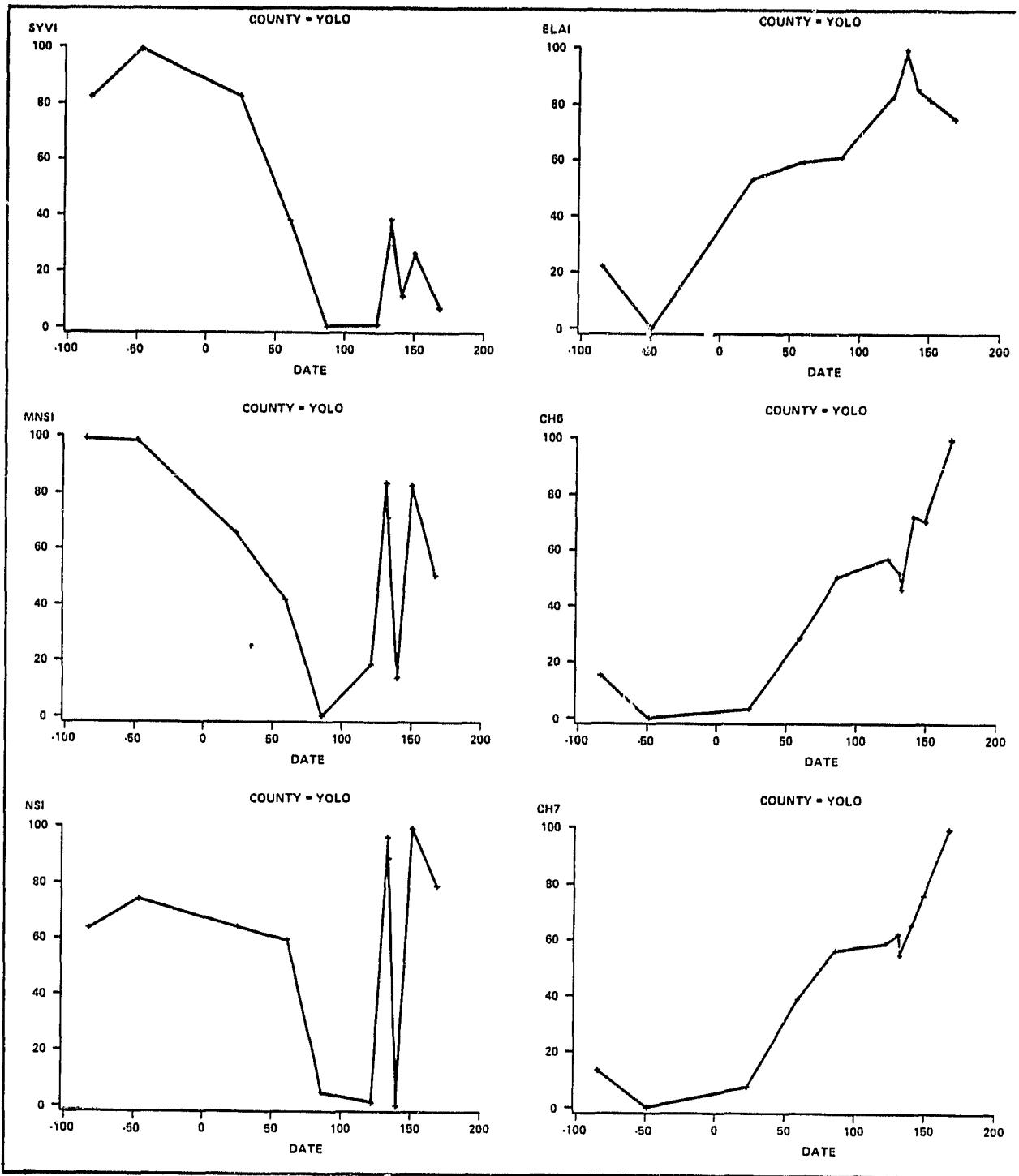


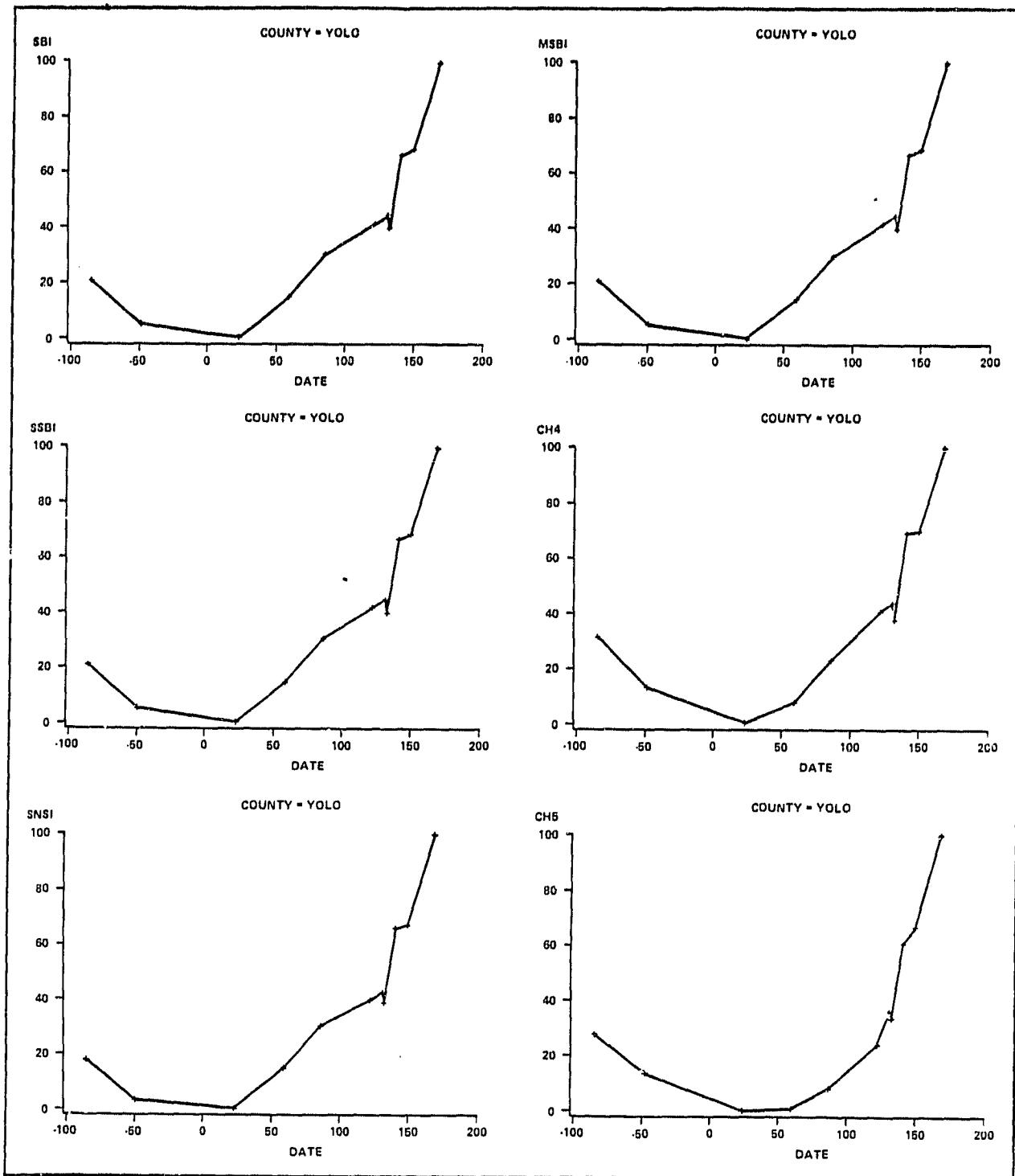






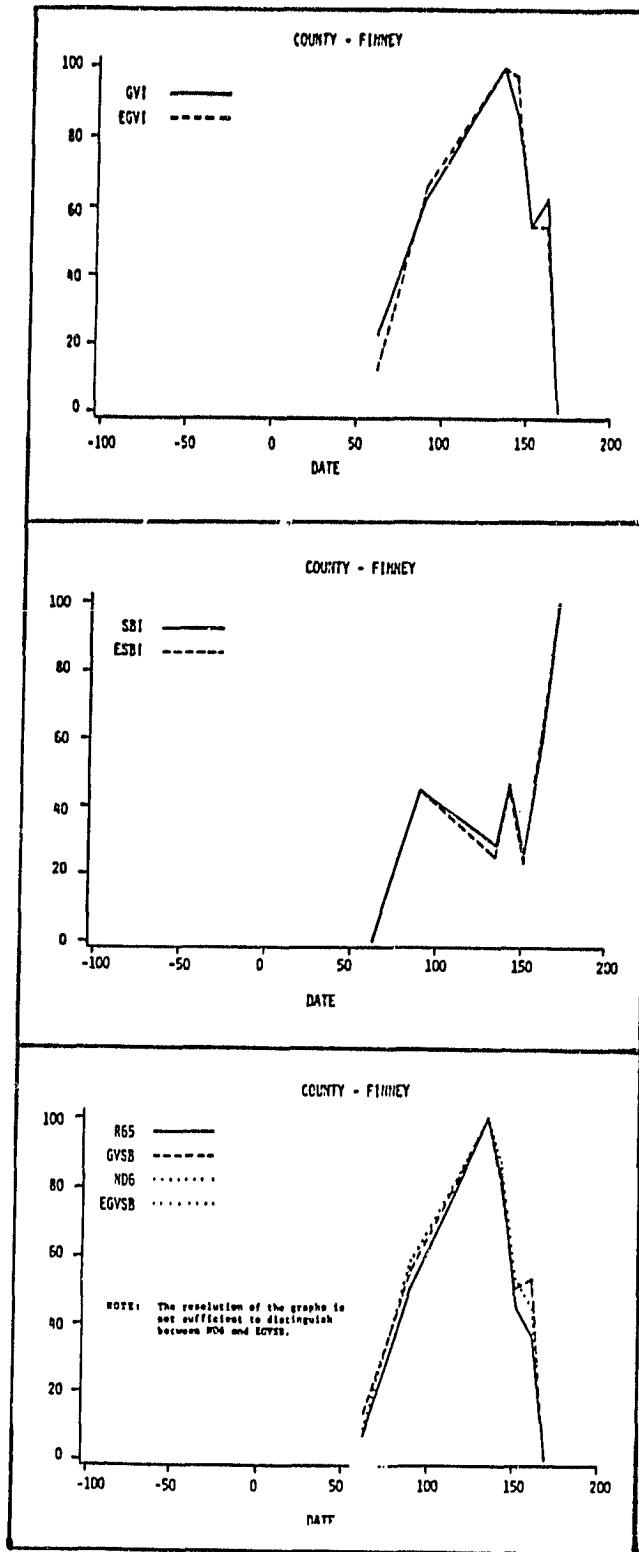




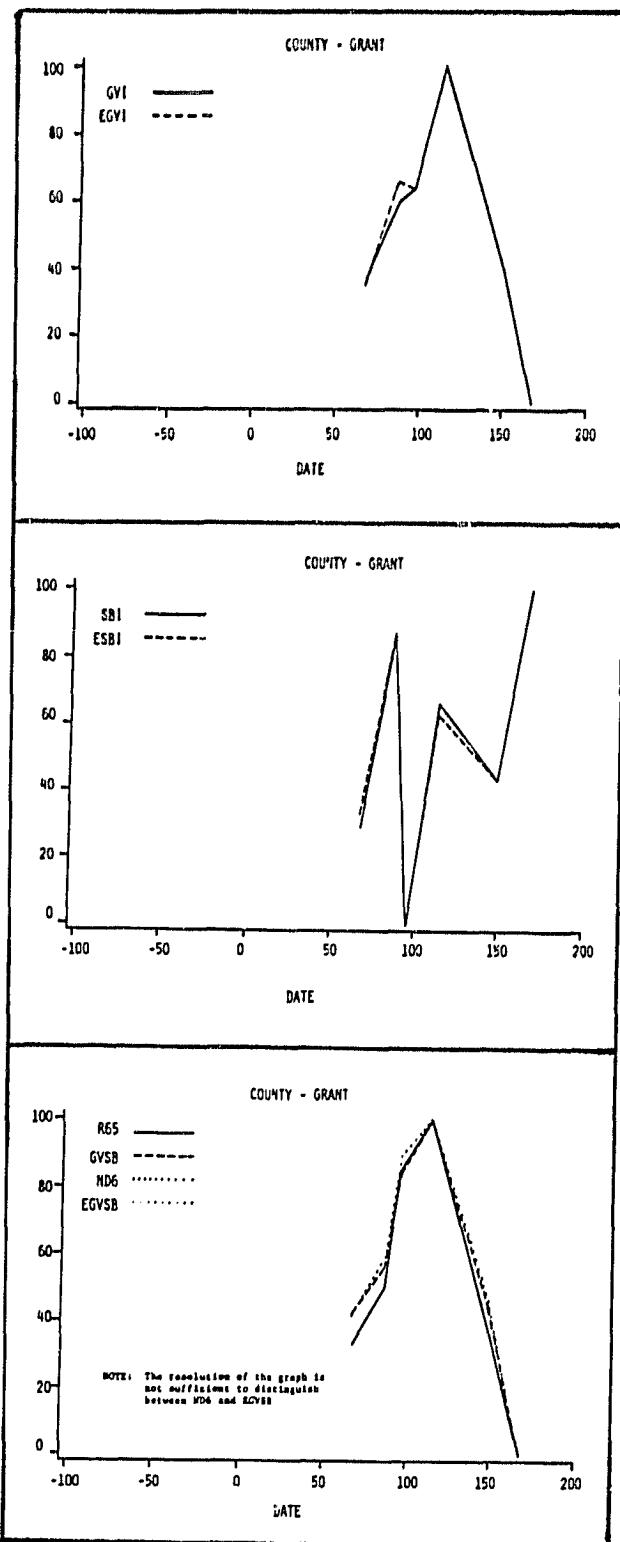


APPENDIX E

VEGETATION INDICES EQUIVALENTS
AND APPROXIMATIONS ILLUSTRATED
WITH TRAJECTORY PLOTS



ORIGINAL PAGE IS
OF POOR QUALITY



ORIGINAL PAGE IS
OF POOR QUALITY

